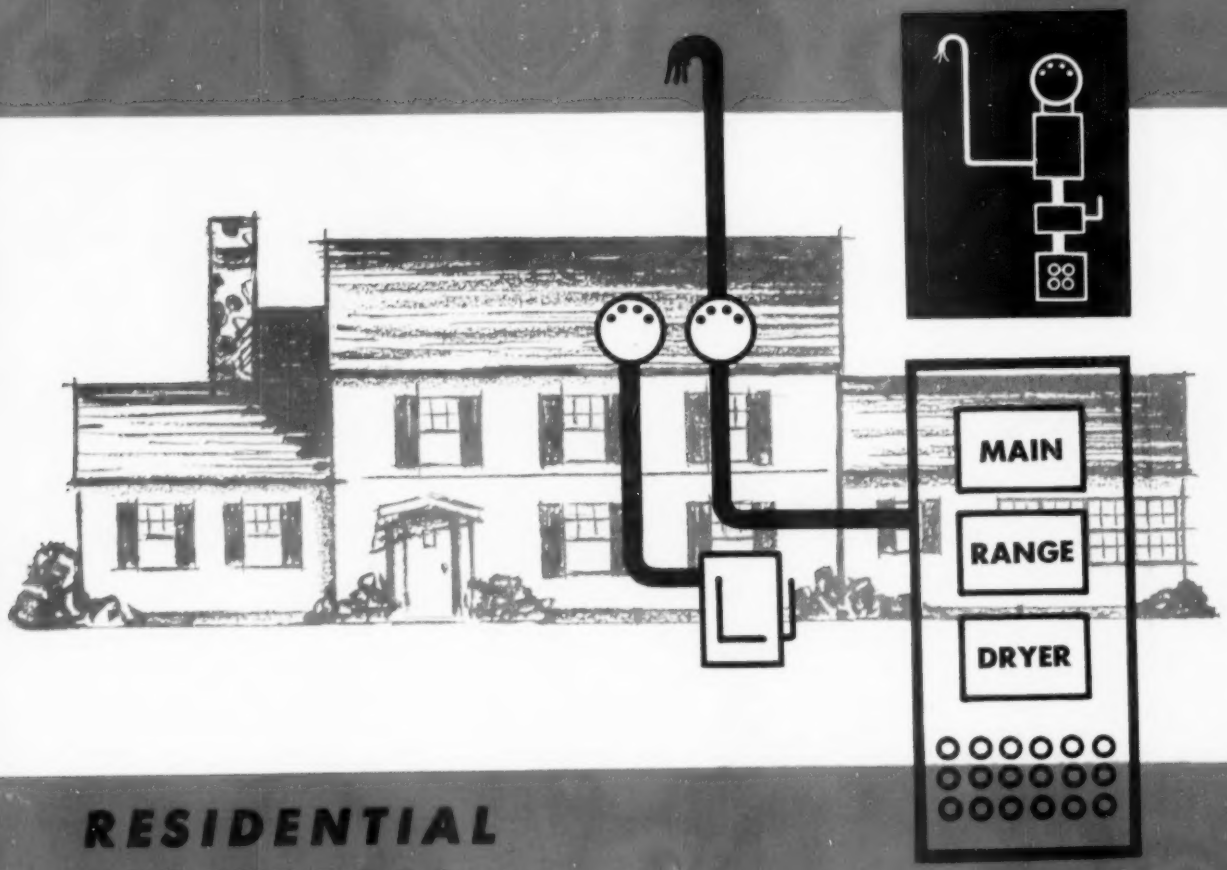
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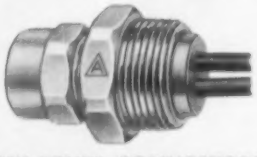
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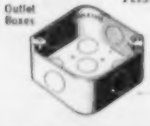
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ELECTRICAL CONSTRUCTION AND MAINTENANCE

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Sidelights

HOUSEPOWER—A new term, "Housepower", has been coined by the Edison Electric Institute for its nation-wide residential electrical modernization promotion. It's a good, meaningful phrase and a welcome addition to the promotional language of the industry. With millions of new potential customers to talk to, we must begin to pay more attention to the meaning of the terms we use—not so much what we like to think they mean—but what they may actually mean or imply to the customer. (See "Don't Rewire—Modernize!", Page 71.)

With home electrical modernization destined to become the most-talked-about market for the goods and services of the electrical contractor, it is particularly important that practical installations carry out the promises of industry promotion and give the customer the valuable new capacity and utility which he needs and expects to get.

Electrical modernization, however, is not a specific product, like a new roof or a 3-ton central air conditioner. It is a technical service installation much of the value of which is in capability to serve loads which, at the time of installation, may have to be anticipated by the electrical contractor under the guidance of the owner. Adequate electrical modernization is likely to differ between areas, even between types of homes. But as the market grows, the industry may develop, as many individual electric leagues already have, more or less standard and identifiable "packages", like the "100-amp" modernization in Kansas City or the "200-amp all-electric" modernization plan in Memphis.

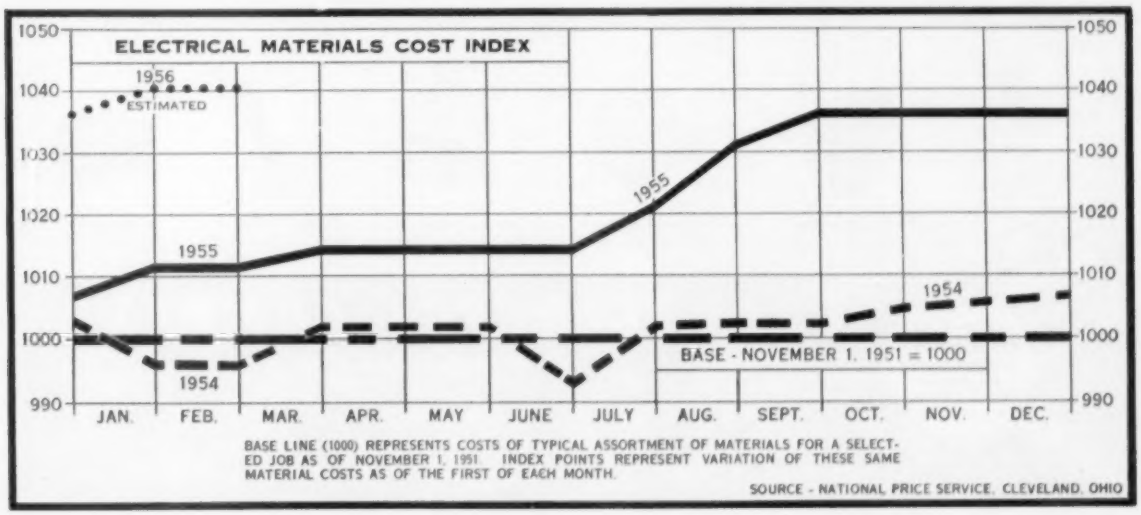
To provide some guide lines into the scope of electrical modernization and to suggest practical design and installation considerations, the editors of *Electrical Construction and Maintenance* have prepared a special report, "Residential Electrical Modernization", which begins on Page 73 of this issue.

HELP!—We are trying to gather a substantial body of practical experience data on various aspects of residential electrical modernization for future editorial reports. If your company is now successfully engaged in residential modernization work, will you please let us know about it and describe the features of your own operations which you feel are helping to develop the full potentials of the market. Information on your own sales promotion, closing incentives, prospect follow-up, pricing practice, job dispatching, supervision, special equipment and tools, special arrangements for inspection or utility connections, etc., would be especially welcome.

We would also appreciate your views on any problems encountered; like do-it-yourself-ers, unfair trade practices, irresponsible competitors or excessive red tape. Please write "on the record" or "off the record" as you prefer.

HEAT EXPERIENCE—An accurate record of electric bills has been kept for a period of six years for a number of small residences on Long Island equipped with electric heating systems. Analysis of the records discloses that electric heat is both practical and economical in this area—providing that the homes are properly insulated. (See "Electric Heat on Long Island", Page 94.)

Electric heat has the significant advantage of lower first cost and maintenance, the disadvantage (in most areas) of higher energy cost relative to fuel burning systems. Consequently, thermal insulation and other means of reducing energy loss through the exterior surfaces, directly affects energy input, the most expensive factor in electric heating.



BASE LINE (1000) REPRESENTS COSTS OF TYPICAL ASSORTMENT OF MATERIALS FOR A SELECTED JOB AS OF NOVEMBER 1, 1951. INDEX POINTS REPRESENT VARIATION OF THESE SAME MATERIAL COSTS AS OF THE FIRST OF EACH MONTH.

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Washington Report

This year's level of business will top 1955, President Eisenhower predicted in his annual economic report to Congress in January. "We are on the threshold of a $400 billion economy . . . accomplished without the specious aid of price inflation" he reported. For 1955, the nation's total output of goods and services (GNP) is estimated at $387.4 billion. The President conceded, however, that the rapid business expansion of 1955 has slowed, but that the "underlying trend still appears to be upward." He reported recent declines in housing starts, auto production, and other activities, but said these "are being amply offset by increases elsewhere." Other significant highlights:

- Asked Congress to cancel corporate and excise tax cuts scheduled under present law to take effect April 1.
- Requested some reduction in the national debt take priority over tax cuts.
- Emphasized the need for new school, highway, flood, health and employment programs.
- Asked for stand-by powers for the Government to regulate terms of consumer credit.
- Urged Congress to act promptly on the Administration's proposed program for helping farmers financially.
- Attributed current decline in housing starts largely to "the limited supply of mortgage money" rather than to a slackening demand for new homes.

New building construction outlays declined seasonally last December to $3.2 billion, down 12% from November but 3% over December 1954. Construction outlays for 1955 were estimated at $42.3 billion, up a sharp 12% from 1954's $37.6 billion record, Depts. of Commerce and Labor reported. Government estimate of new construction expenditures for this year are for a new record of $44 billion, up 5% from last year.

Home building dipped last December to 72,200 privately-financed new housing starts, compared with 89,200 starts in November and 89,900 starts in December 1954. This was the fourth straight month in which starts declined, BLS reported. This spurred the Administration into a relaxation of housing credit to a maximum of 30 years in which to repay VA- or FHA-insured mortgages. The Government tightened housing credit only last July by limiting loans to 25 years for repayment and increasing down payments "to avoid serious dangers of inflation in housing credit."

While housing starts have declined, spending for private non-farm residential building will remain near 1955's record $16 billion level, Commerce and Labor Depts. predict. They estimate private housing starts will total about 1,200,000 units this year, down about 100,000 units from 1955.

Official kickoff of "Operation Home Improvement," a mammoth inter-industry promotion, came at Washington's Mayflower Hotel in mid-January as Albert M. Cole, administrator of U. S. Housing and Home Finance Agency bestowed the Government's blessing on the program. Two aims of program: get more people interested in improving their homes; make it easier for homeowners to get financing, materials, and services. Goal: substantial improvements to 10 million homes in 1956 at cost of $9 billion, and maintenance and repairs to another 10 million homes at cost of $5 billion.

Effects of automation on worker displacement were investigated recently by a Congressional committee, which reported no economic legislation seems to be called for as a result of the hearings. Spokesmen for industry, on the other hand, reported more skilled labor is needed to operate automatic machinery and for maintenance of automatic machines, and that in plants where automatic machinery has been installed employment has increased.



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After the Great Ford Foundation Gift...

What Still Remains To Be Done To Provide Decent Faculty Pay

The Ford Foundation's gift of a half billion dollars to our privately supported colleges, medical schools and hospitals, now being distributed, is magnificent. But it will be much more magnificent if it inspires completion of the job to which it gives a lift. So far as the colleges and universities are concerned, this job is primarily to rescue their faculty members from being second-class citizens economically.

Even in a period when we have become accustomed to astronomical financial figures, a half billion dollars remains an eye-popping gift. In fact, it is so imposing that a good many people who don't read the fine print are apt to conclude that it must just about solve the financial problem to which it is addressed.

Goes Only a Small Way

However, we have allowed college professors to fall so far behind the parade financially that the share of the Ford half billion dollar gift going directly to the improvement of faculty salaries ($210 million) will go only a small way financially toward doing what is necessary to provide adequate salaries.

Completion of this job for our privately supported colleges and universities calls for:

1. An increase in faculty salaries at least five times as great as that made possible by the Ford gift merely to restore salaries to their 1939 purchasing power level and an increase fifteen times as great to provide adequate salaries today.

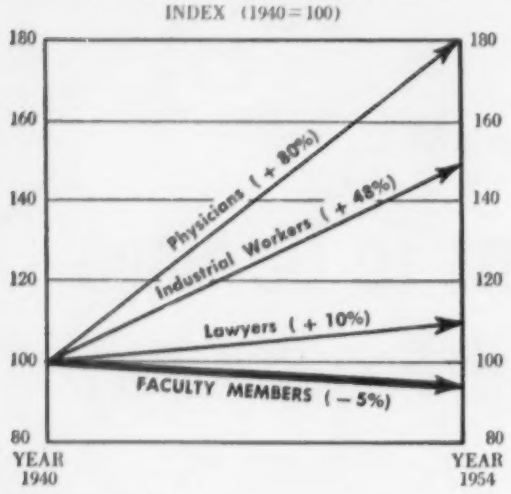
2. Some difficult and courageous decisions by the heads of the colleges and universities in apportioning the grants received by them.

Terms of Gifts to Colleges

The $210 million of the Ford Foundation gift going specifically to improve faculty salaries is being distributed on the following basis: Each of 615 privately supported, regionally accredited liberal arts and science colleges and universities receives a gift about equivalent to its last year's teaching payroll. For ten years only the income from these gifts is to be devoted to raising faculty salaries. After that all the money can be spent in any way the institutions receiving it see fit. There is no requirement that universities having other than liberal arts and science schools limit use of the gifts to improving salaries in these schools alone. They can spread it right through all their faculties if they wish.

In addition to the gift of $210 million specifically directed to increasing faculty salaries, another gift of $50 million goes to a group of 126 institutions selected for specially noteworthy leadership in improving

What's Happened to College Faculty Salaries*



* Real Income before Taxes.

Source: Council for Financial Aid to Education, U. S. Dep't of Commerce; U. S. Dep't of Labor.

the status and pay of teachers. For these schools the individual gifts add about 50% more to the amounts coming from the $210 million fund. They can be used to improve faculty salaries if the institutions choose to do so, but this is not required by the terms of these gifts.

The $210 million plus the $50 million should yield an income of $10-$13 million a year. Even if all this is used to raise salaries, it will be only a small step, however worthy, toward the $200 million per year the colleges need to meet their salary requirements adequately.

Helps Some Who Need It Most

In focussing its gift to improve faculty salaries in privately supported liberal arts and science colleges, the Ford Foundation aims at least part of the help at the spot where it is most desperately needed. Numerous surveys have indicated that the most poorly paid of all college and university faculty members are those in small, privately endowed liberal arts colleges.

But the overshadowing fact is that the teachers in our colleges and universities as a whole are badly underpaid. Just how badly is indicated by the chart above which first appeared in an earlier editorial. (Figures later than those for 1954 are not available.)

The Ford gift will turn the indicator of faculty salaries, which now lies far below the general salary trend, upward a few points. And it will do this in some places where salaries are below the wretched average shown by the chart.

But the Crucial Test Remains

College and university administrators will have the opportunity to extend further the process of getting the help provided by the Ford Foundation gifts where it is most needed. In general, this will mean giving it to senior faculty members, in order to hold experienced teachers and make college teaching attractive as a career. But to make such a division in many schools will take extraordinary fortitude.

The crucial test of the success of the enterprise of the Ford Foundation in raising faculty salaries will lie in whether it prompts the rest of us — college alumni, individuals, business firms and legislators alike — to see that it is a great beginning, not a signal for a recess.

Even with the Ford gifts providing $10-13 million a year, our privately supported colleges and universities must have an increase of about $190 million a year to provide decent faculty salaries.

This is a job far beyond the capacity of the Ford Foundation, imposing though that is. It is a job far beyond the capacities of a few hundred large corporations and a few thousand wealthy individuals. If it is to be done, it is a job at which all of us must work with a will.

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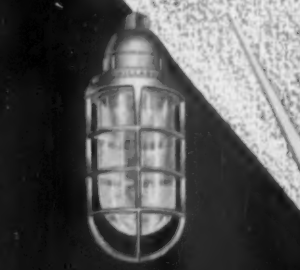
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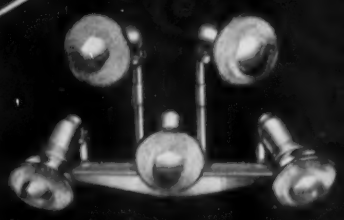
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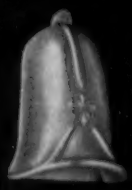
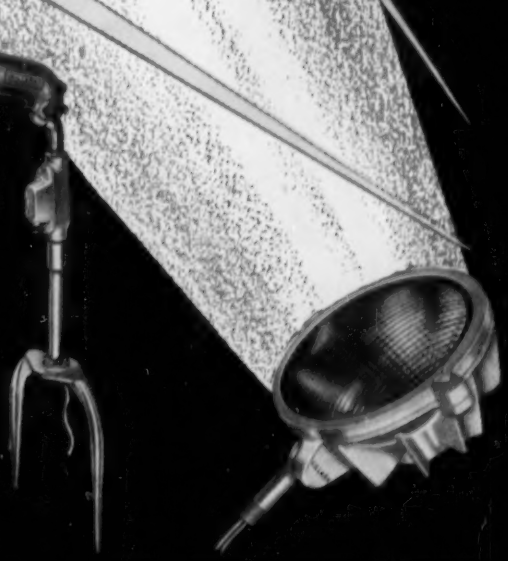
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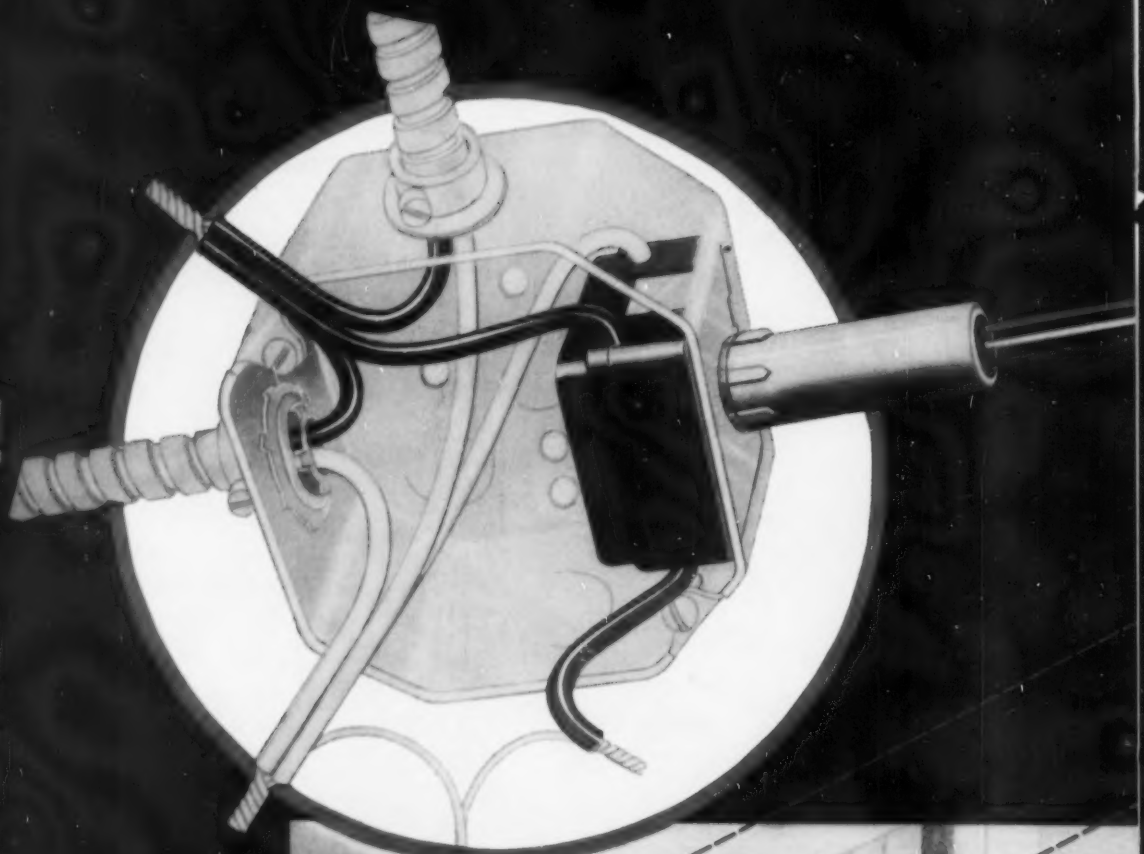
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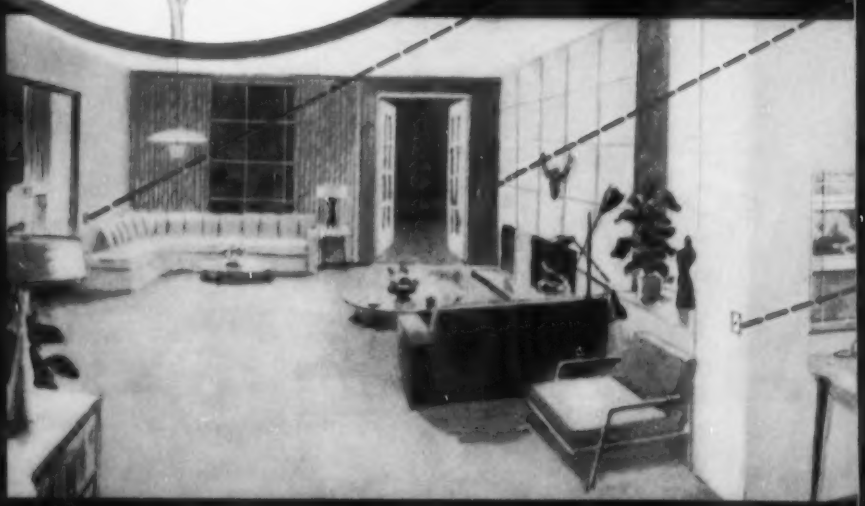
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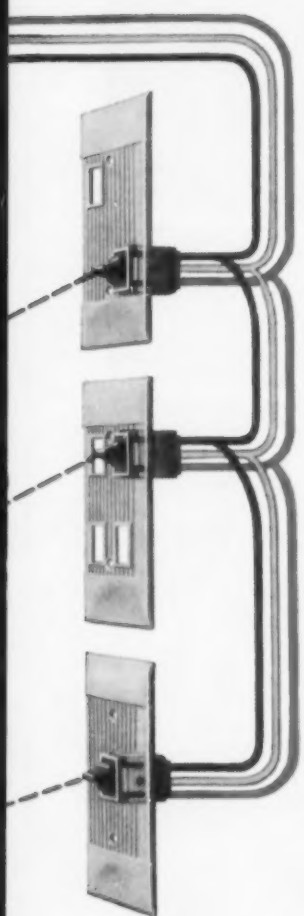


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NEW . . . SIMPLIFIED . . . REMCON is like no other low-voltage switching. Now the source of low-voltage is built into the relay. Remcon means low-voltage with no centrally located external transformers.

Remcon's unique 6 volt method cuts the tugging of cumbersome BX cable to a minimum. Instead, all switch legs are wired with light, pliable low-voltage wire that's easy for you to handle and strip.

It's practical to install even one Remcon r lay and switch, because each relay has its own low-voltage power source. Remcon is also today's most economical way of installing three-way switches.

With Remcon you can control any one light from as many different points as you wish. Lights in various parts of the house can be "remote controlled" from a conveniently located Remcon five-point silent switch.

Ask your jobber to show you the great new Remcon Remote Control Wiring Devices. See the great new wiring and re-wiring profit opportunities now open to you. Learn about Remcon's great new advertising, too. Starting with 3 full pages in House Beautiful magazine, all America is going to learn about Remcon remote control switching.

WRITE TO REMCON NOW. ***Be first in your community to know all about this revolutionary new remote control switching. Remcon will send complete details to you. See your jobber this week. Meanwhile . . . mail this coupon now.***



REMCON Electrical Wiring Device Division
Pyramid Instrument Corporation, Lynbrook, New York

Gentlemen: Rush a copy of the new REMCON Catalog with complete details of this great new low-voltage wiring development.

NAME_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

RE-11



WALTER D. VANCE, JR., *Vice President* • *California Electric Co., reports:*

"We saved 14 days installing 527 fixtures by using 'UP-RIGHT' Scaffold-on-Wheels"

Man-hour savings on this General Motors warehouse job amounted to over 40%. Up-Right Scaffold is so light it is easily assembled by one man. Individual 1 piece aluminum alloy sections are unfolded and set one on top of the other. They lock into place instantly.











Write for descriptive circular ➡

"UP-RIGHT" SCAFFOLDS

Dept. 159 • 1013 Pardee Street • Berkeley, California

Factories: Berkeley, Calif. and Teterboro, N. J. • Offices in all principal cities

NEW COMPLETE MANUAL on BUTYL-BASE CABLES ...for service up to 85C



most complete manual available on butyl-base insulated cables:

- **technical and dimensional data**
- **current carrying capacities**
- **engineering information**

If you're planning an installation of rubber-insulated power or control cable, you'll want to consult this new 48-page manual on Hazard Keystone cables. It is the most complete volume of technical information published on butyl-base insulated cables. In these pages you'll find:

Test data—ozone resistance, heat resistance, moisture resistance, test voltages, corona extinction levels, etc.

Current-carrying capacities—in underground ducts, in air, in enclosed or exposed conduit.

Dimensional data—for direct burial, duct and control cables.

Engineering information—electrical formulas, conductor resistances for both copper and aluminum, methods for determining conduit sizes, maximum pulling tensions, etc.

For your free copy, mail coupon at right to the Hazard Insulated Wire Works, Division of The Okonite Company, Passaic, N. J.

3314

HAZARD insulated cables

Hazard Insulated Wire Works
Division of The Okonite Company
Passaic, New Jersey

Gentlemen:

Please send me your manual on Hazard Keystone Cables.

Name_____

Company_____

Address_____

City_____ State_____

PRODUCT OF OKONITE RESEARCH

MODERNIZE PLANT ELECTRIC SYSTEMS

. . . Show Your Customers How to Turn Hidden Losses into PROFITS!



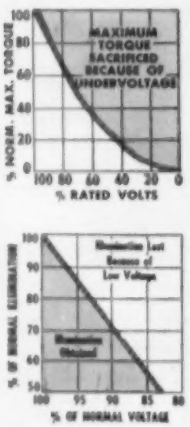


Flexible, compact units fit into any plant. Allis-Chalmers unit substations can be mounted anywhere. Tuck them into a corner of the production floor, mount them on balconies, in the basement, on the roof, or outside the building. Metal enclosures eliminate need for vaults and provide attractive appearance.

ALLIS-CHALMERS

UNIT SUBSTATION

Charts Show Losses when voltage is low. Upper, torque loss at machines. Lower, illumination lost. Placing unit substations at load centers shortens low voltage cable, improves voltage, and makes future changes simpler, less costly than with many outmoded plant arrangements.



Outmoded or inadequate plant electrical systems steal profits. When voltages are low you lose in machine and operator efficiency. Dim lighting cuts inspection and assembly efficiency. Addition of new machinery to plants with older systems frequently causes extra expense for long secondary wiring.

Solve the problem with modern Allis-Chalmers unit substations. Full power is distributed from the center of load. Voltage drop and conductor losses are kept to a minimum. Expensive secondary wires to equipment are short and flexible — it is easy to make changes at little expense.

Let experienced substation engineers help solve your distribution problem. Call your nearby Allis-Chalmers district office. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for your copy of "Power at Load Centers Pays Off."

ALLIS-CHALMERS

A-4740

"Stop crying... I told you to use a Circle F device!"



We at Circle F have long realized that a high "QSP" rating is most important to a growing business

- Top Quality so that customers can depend on your product
- Excellent Service to help clients with electrical problems
- Lowest Prices to assure a good margin of profit.

Check the "QSP" rating before you buy—we at Circle F proudly boast that our "QSP" is among the highest.

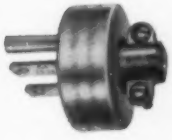
A complete line of devices are available in each of the classifications shown. Write for more information.



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PARALLEL SLOT
DUPLEX RECEPTACLE
Meets and Complies with
new National Electric Code
15 Amp.—125 Volts



NO. 2525
TANDEM SLOT
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Meets and Complies with
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NO. 2527
TANDEM BLADE
ARMORED 3-WIRE CAP
Meets and Complies with
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NO. 2517 B
PARALLEL BLADE
3-WIRE CAP
Meets and Complies with
new National Electric Code

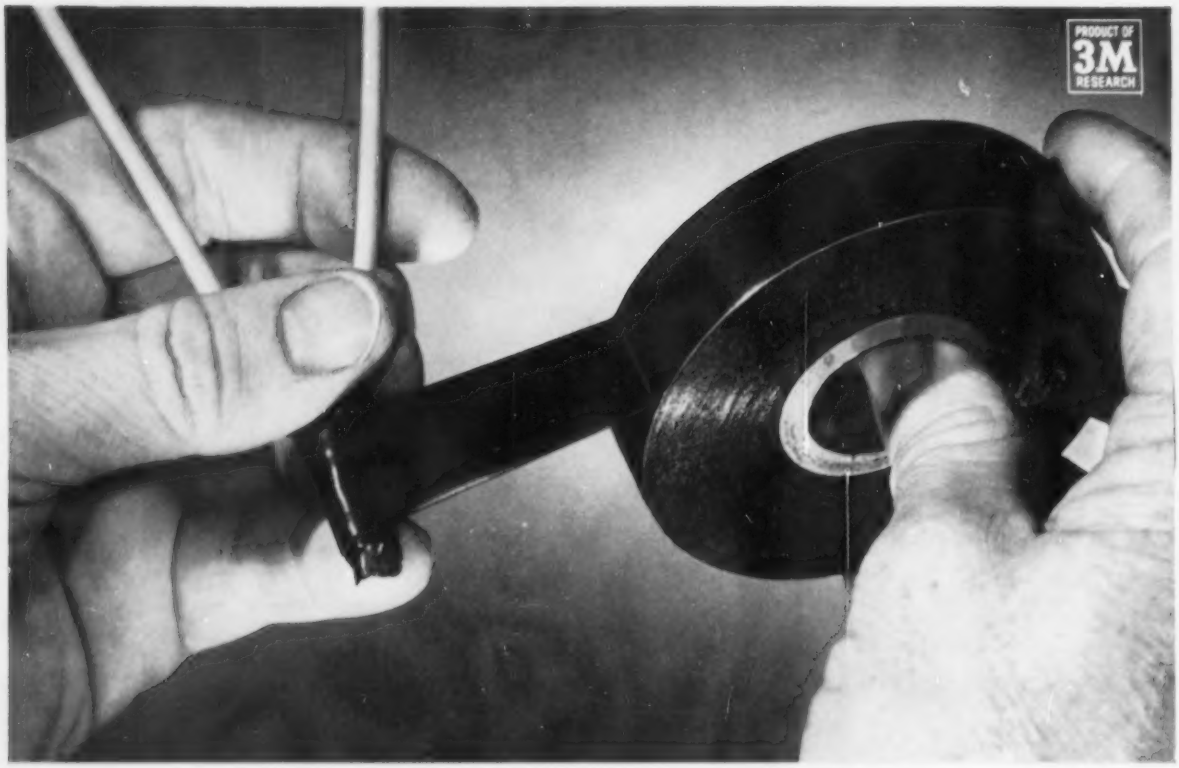
Circle F Mfg. Co.

50 YEARS

TRENTON 4, N. J.

SAVING YOU MORE SINCE 1904

Eastern Insulated Wire Corp. Wallingford, Conn. A subsidiary.



One-tape splicing cuts insulating costs in half!

Figures prove it! "SCOTCH" 33 Plastic Electrical Tape actually cuts your insulating costs in half!

Look at the facts. You need only *one* tape with "SCOTCH" 33. That means you get twice as many splices in the same amount of time. Contractors have proved *that!*

And what splices you get! Never bulky and awkward to work with in tight places such as junction boxes and condulets. "SCOTCH" 33 is more resistant to water, sunlight, oil, acids, alkalies, alcohols and weathering.

"SCOTCH" 33 gives you splices that *last.* And "SCOTCH" 33 gives you electrical and physical protection in a minimum amount of space (9,500 volt dielectric strength – yet only 7 mils thick).

Try "SCOTCH" 33 on your next job. Pocket the difference – with better splices! Learn how you can save even more: new brochure for contractors gives the complete story. Write on your letterhead to 3M Co., Dept. CB-26.



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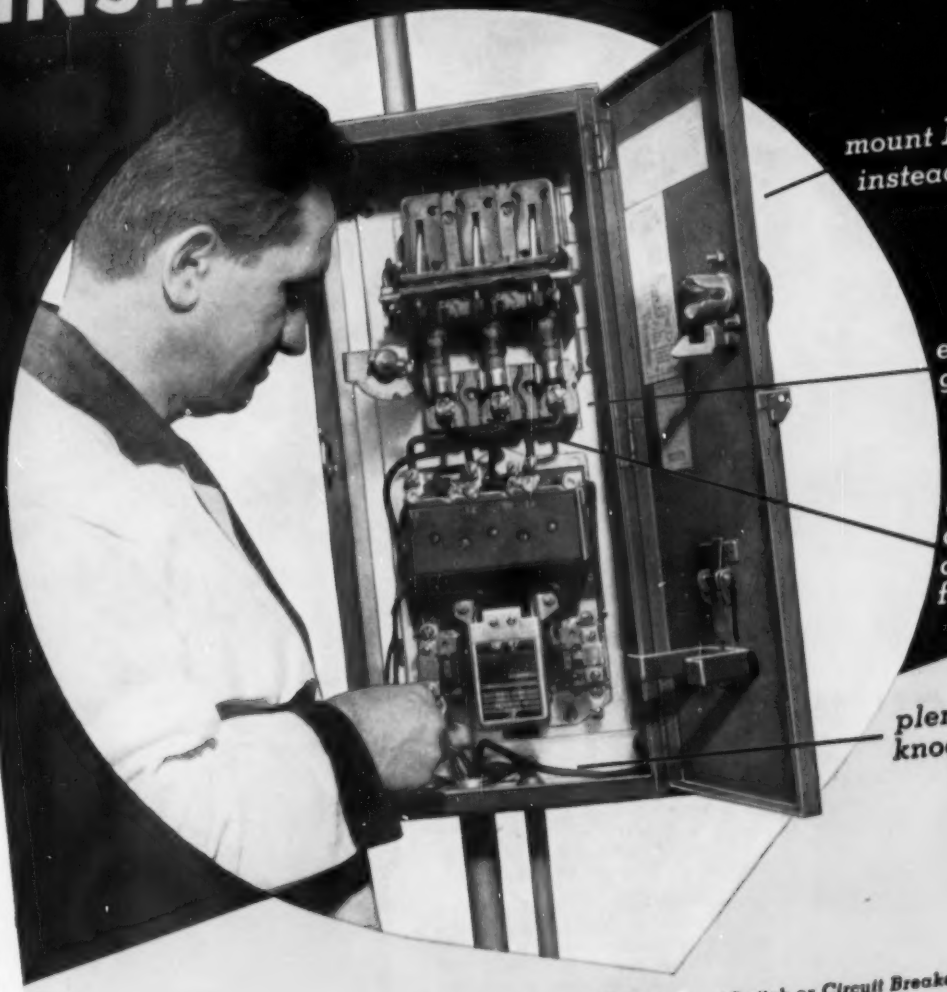
SCOTCH BRAND **33**

Plastic Electrical Tape

The term "SCOTCH" is a registered trademark of Minnesota Mining and Manufacturing Company, St. Paul 6, Minn. Export Sales Office: 99 Park Ave., New York 16, N.Y. In Canada: P.O. Box 757, London, Ontario.

3M COMPANY

EASIER TO INSTALL AND MAINTAIN!



mount 1 device instead of 2

extra-wide gutters

all components accessible from front

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SQUARE D COMBINATION STARTERS

(Switch or Circuit Breaker Types)

Save space and time. Mount and wire one device instead of two . . . neater, more attractive installations.

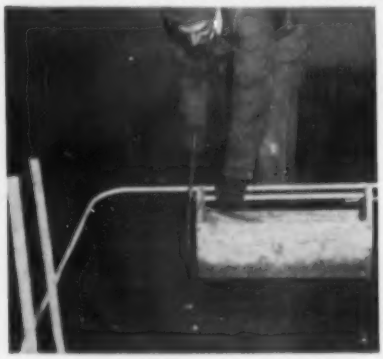
Write for Bulletins 8538 and 8539
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Governor Henry Horner Homes, Chicago Housing Authority, Chicago, Ill. Architects-Engineers: Skidmore, Owings & Merrill, Chicago. General Contractors: Sumner Sollitt Company, Chicago. Electrical Contractors: Emerson Comstock Co., Inc., Chicago. Electrical Distributor: Graybar Electric Co. Inc., Chicago.



CUTTING ELECTRUNITE is easy with ordinary 32-tooth hacksaw blade. "Inch-Marked" in the popular sizes—an exclusive with Republic—you simply measure the distance, not the tubing. There's no messy threading either. ELECTRUNITE's joined by ordinary couplings.

BENDING ELECTRUNITE to the correct radius is simplified using "Inch-Marks". "Guide Line" eliminates "wows". All reference marks for heights of bend and position of bender on tube are cast in the rugged one-piece Republic Calibrated Bender.



REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

250,000 FEET

of Republic "Inch-Marked"® E.M.T. protects big Chicago low-rent housing project

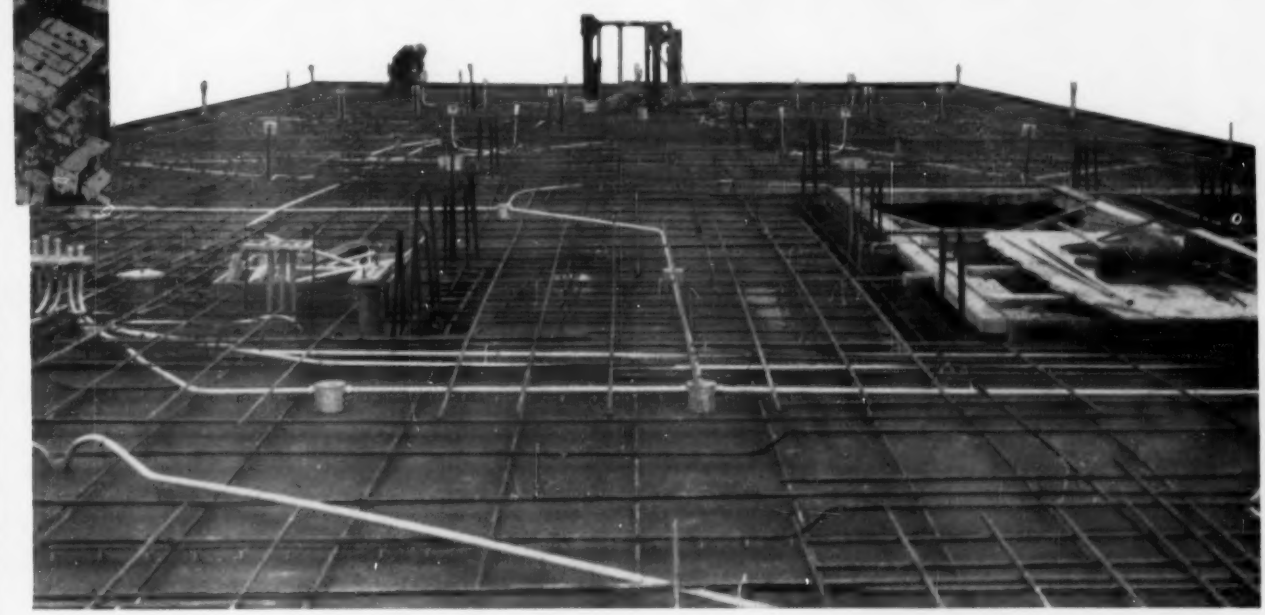
That's a lot of protection—and worth every foot of it. Whether the job is small—or big like the magnificent Henry Horner Housing Project pictured at the left, electrical contractors find that Republic ELECTRUNITE E.M.T.® is easier and more economical to install.

This tremendous job provided electricians plenty of opportunity to take advantage of Republic ELECTRUNITE's money-saving features. Erected by the Chicago Housing Authority, the eight smartly styled apartment buildings included nearly 50 miles of electrical conduit with more bends than you'd care to count.

And yet with ELECTRUNITE's exclusive "Guide Line" that eliminates "wows"—plus the Republic Bender—smooth, accurate bends were easy to make every time. Another exclusive feature, "Inch-Marking", enabled electricians to cut the tubing at these marks without measuring. Additional time was saved by the "inside knurling" feature which simplifies wire-pulling by 30%.

Everyone likes Republic ELECTRUNITE E.M.T. because it makes work easier. There are fewer tools to carry around. No threads to cut. No lines to turn. Lengths are joined by couplings. To make tight joints, just tighten the fitting, not the entire run.

So, for a saving on your next job, whatever the size, specify Republic ELECTRUNITE E.M.T. and get the best run for your money. For additional information, mail coupon.



STEEL

and Steel Products

REPUBLIC STEEL CORPORATION
STEEL and TUBES DIVISION
212 East 131st Street
Cleveland 8, Ohio

Gentlemen:
Please send me additional information on Republic ELECTRUNITE "Inch-Marked" E.M.T.

Name_____ Title_____

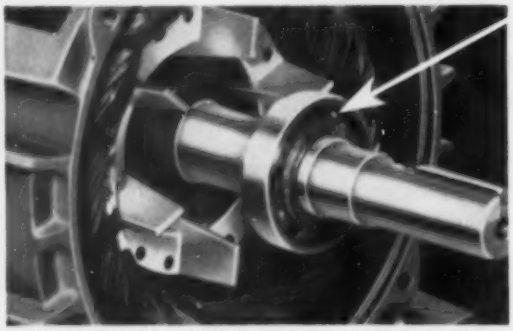
Company_____

Address_____

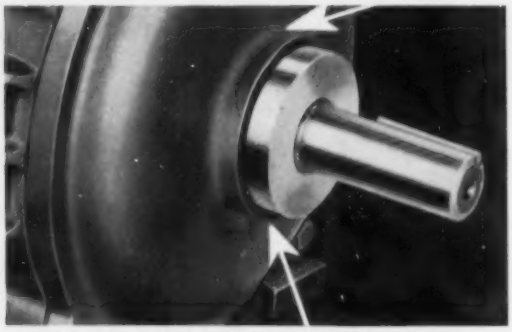
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C-1367

Wagner ELECTRIC MOTORS...the choice of leaders in industry



HEAVY-DUTY BALL BEARINGS—Highest quality bearings of more than ample capacity to carry heavy loads provide long trouble-free service.



BEARINGS CAN BE RE-LUBRICATED—These Wagner motors can be re-lubricated when necessary to prolong bearing life. New grease can be added—old grease removed through openings provided in top and bottom of bearing housing.



BEARINGS STAY CLEAN—Both ends of these motors are equipped with running shaft seals to keep dirt, dust and water from the bearings. There's no grease loss because bearing housings have effective seals to prevent escape of grease.



EASY TO CONNECT—Large diagonally-split conduit box which can be mounted in any of four convenient positions, provides ample room for making connections. Leads are readily identified by numbers stamped on the terminal bushing.

Wagner totally-enclosed motors mean less down-time for machine tools



New NEMA Frames Standard and Explosion-Proof

Wagner totally-enclosed fan-cooled motors are particularly suitable for use on all types of machine tools.

They are fully protected against damage from steel filings, chips, dust, dirt, fumes and moisture. They require no maintenance other than periodic lubrication.

If appearance is a factor, you'll find that the pleasing proportions of these motors give them that functional beauty obtained only when the design is fundamentally *right*.

Ribs on the corrosion-resistant cast iron frames add mechanical strength and increase the surface area for more efficient cooling. Full information and principal dimensions are given in Bulletin MU-203 which is yours for the asking.

Your nearby Wagner engineer can help you select the right motor for your applications. Call the nearest of our 32 branch offices, or write us.



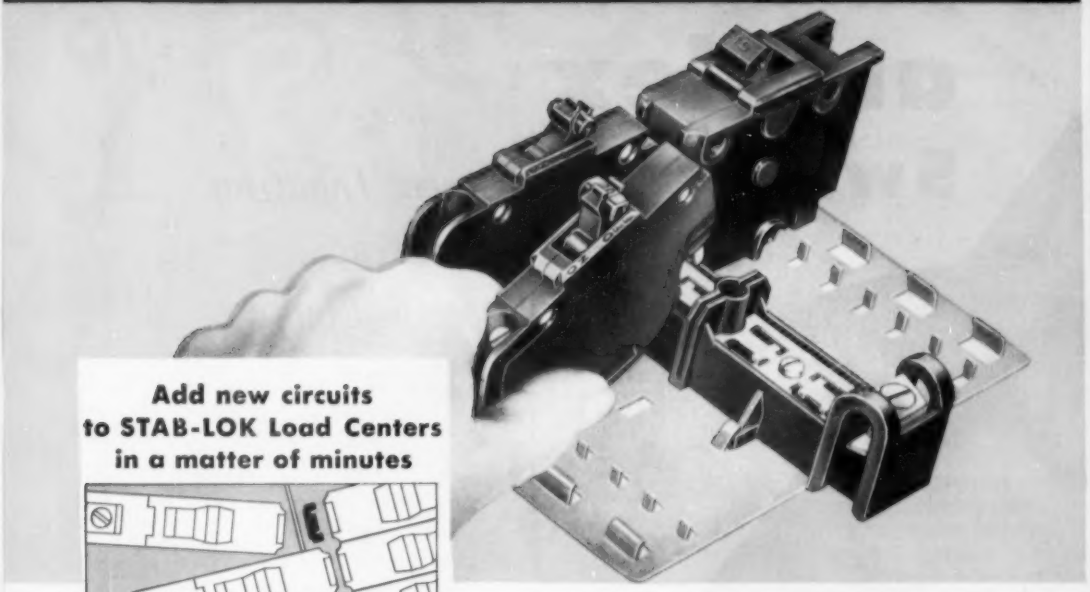
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6413 Plymouth Ave., St. Louis 14, Mo., U.S.A.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

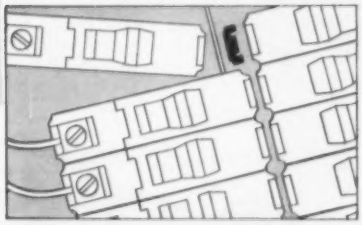
M56-7

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS-AIR AND HYDRAULIC

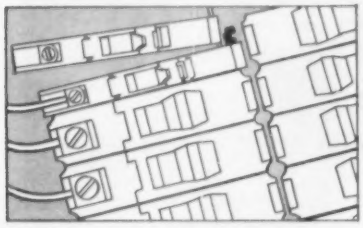
FEDERAL PACIFIC STAB-LOK offers you 2 for 1 ADVANTAGES!



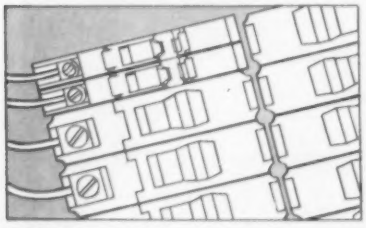
Add new circuits to STAB-LOK Load Centers in a matter of minutes



● **FIRST**—simply remove existing 1", Type NA Stab-lok Circuit Breaker.



● **THEN**—stab-in two ½" Type NC Stab-loks. Connect existing circuit to one Type NC Stab-lok.



● **FINALLY**—wire the new circuit to the second ½" Type NC Stab-lok...and the job is done.

Literally anticipates future circuit requirements!

With Stab-lok circuit breakers, supplementary wiring jobs are easier... less costly... less time consuming than with any other circuit breaker system developed. That's because—with "E" slot construction, Stab-lok anticipates future circuit needs... allows you to protect two circuits in a load center where only one existed before.

And Federal Pacific helps <u>you</u> get your share of the "Electrical Modernization" business!



By showing you how it can be done
Booklet tabulates plans utilized by contractor associations, utilities, banks, etc. to promote electrical modernization. Illustrates free advertising mats.



By convincing your customers directly
Folder explains modern wiring to the homeowner in simple terms; convinces homeowners of the need for a complete wiring job.



By reaching your customers through groups
Movie film, soon to be released, portrays dangers and inconveniences of a poorly wired house. To be shown to groups, clubs, organizations.

AD1—100.01



Finest Products Engineered

FEDERAL PACIFIC ELECTRIC

COMPANY

50 Paris Street, Newark 1, N. J.

For more versatile, effective lighting

amplex Swivelite

Accent Lighting Fixtures... Specified by Experts



Amplex Swivelite C125H "Adapt-A-Unit" construction permits complete interchangeability for all parts for constantly new lighting setups.



Amplex Focalite Won't tip over—easy to focus—most adaptable fixture for lighting displays.



Colorbeam Reflector Lamp Amplex Colorbeams come in 14 striking colors, rated life of 2,000 hours.

Yes, the "Adapt-A-Unit" construction of Amplex Swivelite fixtures permits endless variety in achieving beauty and concentrated light for attention-getting effects... with a minimum number of basic units. These are without question the finest, most adaptable "working tools" for achieving up-to-date lighting with real *selling power*. And for more striking and colorful light, specify Amplex Spots, Floods and Colorbeam Reflector Lamps, designed especially for Amplex Swivelite fixtures. Write for new catalog describing the Swivelite *big four* exclusive features that produce effect, efficiency, economy.

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Guarantee Satisfaction By Having Your Lighting Plan Certified to Meet NATIONAL STANDARDS

Now you can get the 3 business-clinching sales tools you've always wished you had to sell more lighting jobs! (1) Now you've got a tested way to prove to customers that you can and will deliver the kind of lighting they need. You've got a CERTIFIED Lighting Plan to back you up. It's the best way yet developed to keep customers from being tempted into buying sub-standard jobs because of price! (2) You've got the PLUS FEATURES Check List to sell MORE QUALITY into the job and get a bigger order, too! (3) You've the certificate issued by a disinterested authority countersigned by you, to back up your selling of proper illumination. Get all the facts... write for free booklet.

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Certified Lighting for a Better America

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NATIONAL LIGHTING BUREAU, 155 East 44th Street, New York City, Sponsored by the Industrial and Commercial Lighting Equipment Section of NEMA the National Electrical Manufacturers Association

10119-B

This program is sponsored by all these member companies of the Industrial and Commercial Lighting Equipment Section of the National Electrical Manufacturers Association to help you increase your sales...

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Now, *quality*



high-voltage cable at less cost:

with **new RoZone-RoSeal**

Excellent for industrial use

Superior moisture resistance compared to other types of nonmetallic sheaths: That's just one advantage of RoSeal, Rome Cable's new special thermoplastic sheath for shielded power cable rated up to 15 KV.

RoSeal has particularly high resistance to oils and most chemicals, making it especially adaptable for installation in chemical plants, refineries, paper mills, steel mills and the like.

In its new RoSeal, Rome has perfected a sheathing material which better fulfills all requirements for a shielded power cable sheath, eliminates many disadvantages of other sheathing materials, *and* reduces cable cost.

In the case of RoZone-RoSeal cable, the new RoSeal sheath is applied over Rome's premium quality oil-base type insulation, RoZone. Thus, the new RoSeal sheath, combined with time-proven RoZone insulation, offers seven other advantages, in addition to its outstanding moisture resistance.

1. The coefficient of friction of RoSeal is considerably lower than other sheathing materials. This makes it much easier to pull in ducts or conduit.
2. RoSeal is easier to bend and install at subzero temperatures. Minimum recommended installation temperature is −40°C.
3. RoSeal has proved satisfactory for *both* underground and overhead use.
4. RoSeal is durable and long lasting —has a life expectancy at least equivalent to polychloroprene sheath.
5. RoSeal is flame resisting.
6. RoSeal provides a rugged mechanical barrier. Its tensile strength, hardness and other mechanical properties are designed for the job.
7. RoSeal is resistant to microorganism attack. Its resistance to weathering and soil conditions is also equal to that of polychloroprene sheaths.

Electrical tests made in the Rome laboratories show uniformly higher corona level and dielectric strength for RoSeal jacketed power cables.

We invite you to prove for yourself the value of RoSeal. Write today for a sample of RoZone-insulated, RoSeal-sheathed power cable. You'll find it's everything we have stated here.

It Costs Less to Buy the Best

ROME CABLE ROME, N.Y.

ROME CABLE
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ROCKBESTOS VARNISHED-CAMBRIC CABLE

Quality Engineered to Provide Superior Performance

NOTE THESE UNUSUALLY HIGH STANDARDS FOR VARNISHED-CAMBRIC TAPES

Rockbestos VC tapes are made to our own exacting specifications which incorporate all the requirements called for in all IPCEA Standards.

PLUS

- A special surface treatment applied to insure that the tape will wrap properly to provide uniform dielectric strength and good bending characteristics in the completed cable.
- More rigid tape thickness requirements to insure uniformity of cable diameters.
- Rockbestos special Surface Hardness Test, not found in industry standards, insures varnish film that will not become damaged in processing or handling which the cable may get in service.
- Controlled methods of application of tapes avoid overstress of tapes assuring uniform dielectric insulation throughout the entire length of the cable.
- Add to this thirty years of know-how in the application of VC tapes for high temperature application on Rockbestos AVC cables and you have a VC cable that insures trouble-free operation and long life.

Rockbestos Braided *Varnished-Cambric* cables are stocked in 600 volt and 5,000 volt ratings for *immediate delivery*.



ROCKBESTOS PRODUCTS CORPORATION
NEW HAVEN 4, CONNECTICUT

NEW YORK • CLEVELAND • DETROIT • CHICAGO • PITTSBURGH • ST. LOUIS • LOS ANGELES
OAKLAND, CALIFORNIA • NEW ORLEANS



Electricians everywhere are saying, "The new C-H 4151 is IT. There is nothing like it on the market." You'll say so too . . . for three big reasons. It installs easier. It works better. It lasts longer. Check these features.

Installs easier—The high strength phenolic molded unit base (not breakable porcelain) is removable by two screws for 3-point mounting of the enclosing case and wire pulling freedom. All "easy-tite" terminals are out-front eliminating skinned knuckles and wire "pretzel" bending. "Easy-tite" terminals make wiring as simple as one, two, three. 1. Insert wire in hole provided. 2. Pull down to screw terminal. 3. Tighten.

Works better—Solid silver double break butt type contacts have long been standard equipment on quality motor control, and now Cutler-Hammer's exclusive *A-c* design incorporates all these features in the *midget* 4151 safety switch. Positive break of the butt type contacts is accomplished by the camming action of the toggle operator. A non-current carrying compression spring snap-closes the contacts when flipping the toggle to the "on" position. This spring can't heat and lose its tension; therefore, always insures constant and uniform contact pressure.

Lasts longer—Top performance at low cost is due to the 4151 being engineered for *A-c* service exclusively. Face-to-face closing of butt type contacts receive only a fraction of the wear common to other general use safety switches. Double break contacts halve the arc voltage and further increase the contact life. Solid silver contacts are known to have superior life to either copper or bronze. A Cutler-Hammer "first." A Cutler-Hammer exclusive.

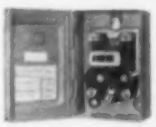
Order the C-H 4151 *midget* Safety Switch from your authorized Cutler-Hammer Distributor today. CUTLER-HAMMER, Inc., 1306 St. Paul Ave., Milwaukee 1, Wis.



4151-H241 30 Amp. 2 wire S/N; 1 Fuse. 120 Volts A-c. Dimensions: 2⅞" x 5⅛" x 2¼". List: $4.20

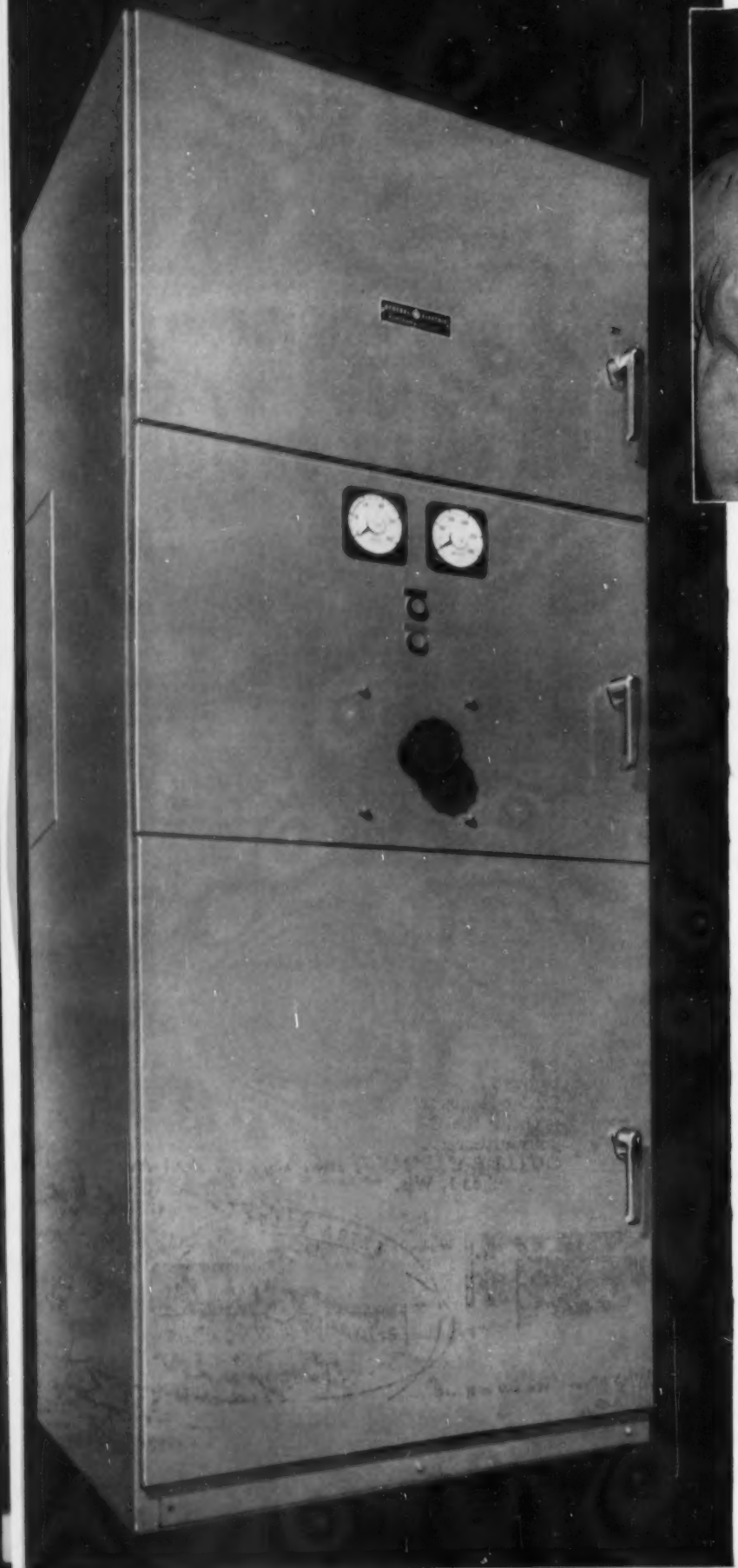


4151-H201 30 Amp. 2 Pole; 2 Fuses. 120/240 Volts A-c. Dimensions: 4" x 5⅛" x 2¼". List: $5.20



4151-H341 30 Amp. 3 wire S/N; 2 Fuses. 120/240 Volts A-c. Dimensions: 4" x 5⅛" x 2¼". List: $5.50

EXTRA VALUE
CUTLER-HAMMER
SAFETY SWITCHES
C-H
AT NO EXTRA COST





3 CUSTOMERS STATE . . .

Space, Safety

Placed on the market in July of this year, General Electric's all-new Limitamp Control has received enthusiastic acceptance throughout industry.

1. NEW MOUNTING ARRANGEMENTS. Almost immediately, L. L. Hamig, of Ferris & Hamig, Consulting Engineers, found the exclusive front-connected feature of the new control solved a tough application problem. There is no need for a back aisle with the new equipment, so units may be mounted back-to-back, back-to-wall, or as free standing enclosures yielding great space savings.

2. 50% SMALLER. In another case, H. A. Weigand, of Ingersoll Rand Company specified this new fused starter in a compressor station for the Laclede Gas Company of St. Louis, Missouri. Mr. Weigand stated the new control's 50% floor space saving feature simpli-

50% smaller than previous models, all-new G-E Limitamp Control offers a gang-operated disconnect switch as standard equipment. See opposite page for space savings comparisons.



"The all front-connected feature of G.E.'s Limitamp Control gave me the versatile floor arrangement I needed to solve a tough application problem," said Mr. L. L. Hamig (extreme left) of Ferris & Hamig, Consulting Engineers, St. Louis, Mo. Seated are R. E. Watts of Ferris & Hamig and P. L. Korklan, General Electric Co. Sales Engineer.

"The space savings offered by G.E.'s Limitamp Control helped simplify the installation of a compressor station for the Laclede Gas Co. of St. Louis," according to H. A. Weigand of Ingersoll Rand Company. The compressor station is located in a residential area and conforms to local building codes. This put space requirements at a premium and posed a real installation problem.



Problems Solved by New G-E Limitamp* Control

fied installation where space considerations were a primary factor.

3. ADDED SAFETY. One of the nation's largest automobile manufacturers ordered eight of the starters and within days increased the order to 17. The gang-operated disconnect switch and co-ordination features which afford greater protection of the starter, the controlled equipment, and personnel were exactly what they wanted.

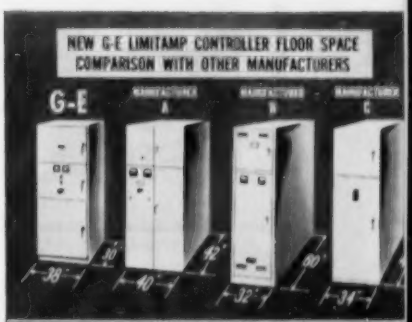
The 30" depth of the new Limitamp Control, which allows the unit to be transported through normal size doorways, has also received industry-wide approval. The unit's 90" height includes bus compartment which is surrounded by steel barriers within the enclosure.

Other features which save time and money on installation and maintenance are the low-voltage panel, hinged to swing out of the cabinet, and the contactor which may be easily rolled in or out of the enclosure. This provides ample room for a worker to enter the enclosure while making installation connections.

This all-new Limitamp Control is ideal for high-voltage motors, rated 2300-4800 volts, up to 3000 hp, and may be applied to squirrel-cage, synchronous, wound-rotor, and multi-speed motors on power systems requiring high interrupting capacity for maximum short-circuit protection.

Specify the all-new Limitamp Control through your nearest G-E Apparatus Sales Office. G-E engineers will help apply this new control to your operation. For more information write for Bulletins GEA-6331, GED-2446, to Section 781-14, General Electric Company, Schenectady 5, New York.

*Trade-mark of General Electric Co.







Progress Is Our Most Important Product

GENERAL ELECTRIC

AMERICAN BLOWER HELPS YOU SOLVE THESE EVERYDAY BUSINESS PROBLEMS

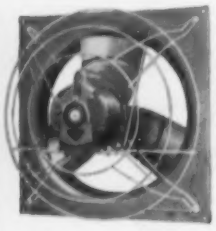
When you standardize on American Blower's complete line of fans and blowers, you simplify and smooth out many problems that arise in business.

You reduce inventory. Stocking competing lines invariably means duplication of sizes. You'll gain more shelf space, and minimize shipping mistakes, by stocking one line in the most called-for sizes.

You help your own salesmen. Learning the nomenclature, the "ins and outs" of several lines wastes valuable sales time. A single line simplifies the salesman's job — lets him serve customers better and faster.

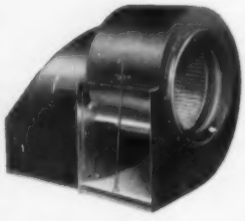
You save clerical expense. Handling multiple lines of ventilating equipment means higher clerical expenses. *One* line makes bookkeeping easier, frees employees for other work.

Standardize on American Blower — the most *complete* line of propeller fans and blowers, attic fans, and home ventilators offered by any manufacturer. Your nearest American Blower Branch Office is the place to call for complete information. Call today.



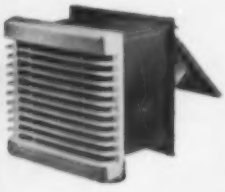
VENTURA FANS

A complete line of propeller fans for commercial and industrial ventilation. Certified ratings. 10 to 72 inches.



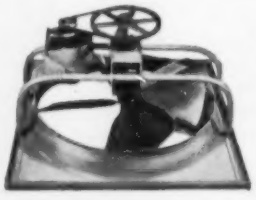
UTILITY SETS

Designed for general supply or exhaust duty where duct work is required. Self contained. Multi-blade wheels — 3 to 36 inches.



HOME VENTILATORS

An Aeropel home ventilator is ideal as a kitchen fan, or for many small commercial ventilating jobs. Quiet, easy to install, smartly styled.



ATTIC FANS

For comfort cooling at low cost in homes, apartments, hotels. V-belt drive, low fan speed. Models for vertical or horizontal operation.

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CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American-Standard

AMERICAN 75th ANNIVERSARY YEAR **BLOWER**



FLORA BALLAST* SHOWS how easy it is to make across-the-counter in-warranty replacement of G-E ballasts at no cost to you, from your nearby G-E Ballast Service Center Distributor. They carry ample stocks of G-E ballasts from which you can select replacements for any make ballast.

Flora explains how . . .*

More Than 800 G-E Ballast Service Centers Help You Save Lighting Dollars

When it is necessary to obtain an immediate ballast replacement you'll get prompt service at the G-E Ballast Service Center Distributor located nearest you. The complete stocks and convenient location help you save time and money. There are G-E Ballast Service Centers in every major city—more than 800 of them in the United States. Here you can make NO CHARGE in-warranty replacements of G-E ballasts . . . and replace *any make* ballast with a high quality G-E unit. And G.E. gives you top quality at low attractive prices too. Save time and money—solve your ballast replacement problems at your nearest G-E Ballast Service Center.

When you buy G-E ballasts you get other services too. G.E. maintains a network of national warehouses to speed volume orders. More than 150 trained sales engineers from G-E Apparatus Sales Offices are available to give you help in applying G-E ballasts and in servicing G-E ballast installations.

A G-E ballast tag or sticker on your fixture is proof that it is equipped with the best in ballast value. It's the easy way to be certain. For a complete presentation on G-E ballasts, contact the G-E Apparatus Sales Office nearest you or write Section 401-16, General Electric Company, Schenectady 5, New York.

*Miss Fluorescent Ballast, G.E.'s Ballast Mascot

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EXPERIENCED G-E BALLAST ENGINEERS are available to help you plan and service fluorescent lighting applications. For help, contact your nearest G-E Apparatus Sales Office.

Five more reasons why

GENERAL ELECTRIC IS YOUR BEST BALLAST VALUE

- EXCLUSIVE SOUND RATING SYSTEM
- SUPERIOR QUALITY CONTROL
- LONGER BALLAST LIFE
- PRECISE LAMP-MATCHED DESIGN
- PROVED PRODUCT LEADERSHIP



Progress Is Our Most Important Product

GENERAL ELECTRIC



Write for this new folder about first aid for wiring protection

Youngstown

BUCKEYE QUALITY YOUNGSTOWN SERVICE CONDUIT

●Youngstown Buckeye Conduit is full-weight rigid steel and is manufactured as Hot Galvanized, Electro-Galvanized and Black Enameled. It is available for immediate delivery in sizes from half inch up to six inches. We can also furnish Electrical Metallic Tubing in sizes from half inch up to two inches.

"4 Ways to Greater Efficiency, Lower Installation Costs" is a new folder giving a full description of each type, with complete information as to wall thicknesses, fittings, etc. Copies are available at no charge to guide you and your customers in the selection of steel conduit. Write for as many as you can use.

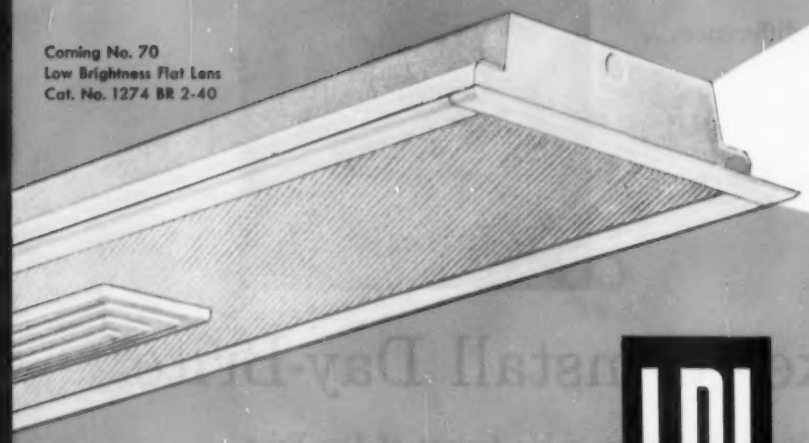
Rigid steel conduit is the SAFE raceway approved by the National Electrical Code for all hazardous locations. To be ENTIRELY SAFE use the best, use Youngstown Buckeye Conduit, your first aid for wiring protection.

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices: Youngstown, Ohio - District Sales Offices in Principal Cities

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - BAR SHAPES - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - RAILROAD TRACK SPIKES

Only 2 7/8" above ceiling line



Corning No. 70
Low Brightness Flat Lens
Cat. No. 1274 BR 2-40



NEW LPI Thin-Lite TROFFERS

Require less than ½ the depth of ordinary troffers

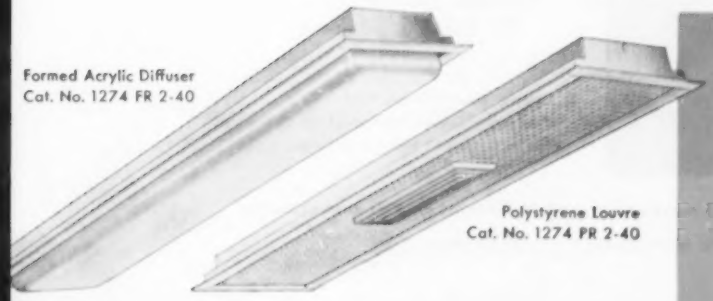
In new buildings, Thin-Lite Troffers can be used in shallow ceiling slabs and also provide, where required, extra room for air conditioning ducts, piping, etc.

In old buildings, where modernization requires suspended ceilings, the depth saved by the use of Thin-Lite Troffers allows more duct room and head room.

Finest construction combined with functional design give Thin-Lite Troffers a clean-cut appearance when installed. Choose from three types of shielding and diffusing media: Polystyrene louvre panel, Corning No. 70 low brightness flat lens, or formed Acrylic diffuser. For your next installation specify Thin-Lite Troffers.

Certified Lighting for a Better America

Mail Coupon for Detailed Information about Thin-Lite Troffers



Formed Acrylic Diffuser
Cat. No. 1274 FR 2-40

Polystyrene Louvre
Cat. No. 1274 PR 2-40

LIGHTING PRODUCTS, INC. Dept. 4 Highland Park, Illinois

Please send me a copy of Thin-Lite Troffer Brochure No. 545

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Company _____

Address _____

City _____ Zone ____ State _____

102

Lighting by DAY-BRITE makes the big difference...



Donald Dingman of Dingman's Electric Service, Redwood City, California

"We like to install Day-Brite"

"From the contractor's standpoint, a big feature of Day-Brite fixtures is their ease of installation and lining up. In one of our recent jobs—the Henry Ford School—we particularly appreciated the ease with which Day-Brite's A-J adjustable hangers permitted us to clear several clocks mounted on angular slopes between ceilings and walls.

"Another thing we like is their easy accessibility for lamping and cleaning—this is especially appreciated by the users."

These comments by Donald Dingman are typical of hundreds made by contractors throughout the United States. Why don't you try Day-Brite—and see.



"DECIDEDLY BETTER"
DAY-BRITE
Lighting Fixtures

Day-Brite Lighting, Inc.
5402 Bulwer Ave.
St. Louis 7, Missouri

Exterior view of Henry Ford Elementary School, Redwood City, California—one of Dingman's recent installations.

61113

Nation's largest manufacturer of commercial and industrial lighting equipment

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Coming soon — very soon — the greatest residential business building drive the electrical industry has ever known.

Its theme?
LIVE BETTER . . . ELECTRICALLY.

Its objective? To sell all the benefits of electrical living, and increase development of the residential market for electrical products. This means promoting the sale of electrical equipment and appliances, up-to-date home wiring and electric homes.

You'll be hearing more about it soon.

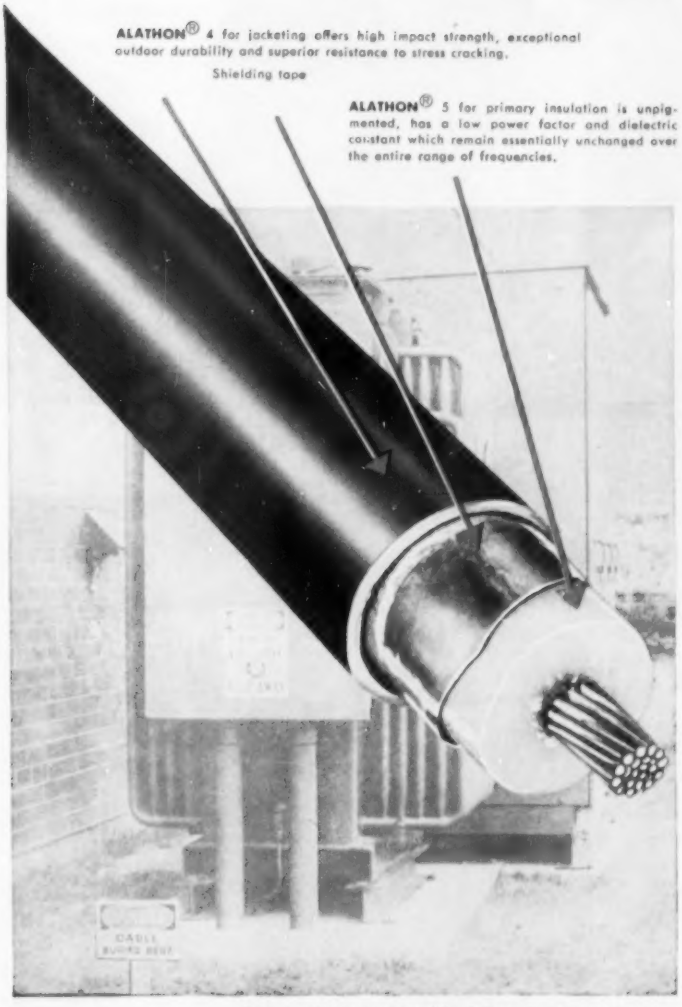
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Lightir



Buried 15 Kv high-voltage cable

gets lasting protection with Du Pont ALATHON®



Cable supplied by Anaconda Wire & Cable Co., New York, N. Y.

A cable operating at 15 Kv underground must be constructed with insulation and jacketing which assure lasting, trouble-free protection. The insulation must have exceptional dielectric strength and the jacketing must have outstanding resistance to mechanical damage, chemical action and moisture. When a large eastern chemical company needed such a power cable for their new testing laboratory, they specified insulation and jacketing of "Alathon."

Du Pont "Alathon" polyethylene resin features low power loss and low dielectric constant, toughness and flexibility, even at extremely low temperatures, and outstanding moisture resistance. With insulation or jacketing of "Alathon," you get cable that is light in weight, flexible and easy to handle. Installation is speeded by its ease of pulling, cleanliness in handling, and simplified jointing and terminating requirements.

To get complete property and application data on "Alathon," clip and mail the coupon below.

There is a difference in polyethylenes—insist on insulation and jacketing of ALATHON®

DU PONT
ALATHON®
Polyethylene Resin
BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

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Please send me complete information on Du Pont "Alathon" polyethylene resins. I am interested in evaluating these materials for .....

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Specify the *Levolier* No. 71 WHERE SPACE IS LIMITED



It's only 15/32" thick

Here's just the switch you need for your streamlined lighting canopies and fixtures, and FHP motor housings where switch space is limited. Only 15/32" thick, Levolier No. 71 fits in the smallest spaces. It carries Underwriters' "T" rating on the famous Levolier mechanism that assures dependable, trouble-free switch performance. Furnished with durable molded phenolic case, patented lever control, pull chain and 6" wire leads.

SEND FOR THIS **NEW** McGILL CATALOG



Complete information on the complete line of McGILL *products*

Organized for ready reference, this beautifully illustrated 48-page catalog contains detailed information on Levolier® switches, McGill industrial lampholders, McGill lamp guards and parts and accessories. Ask for Catalog No. 84.

only McGILL *makes* Levolier® *Switches*

EXCLUSIVE CLAMP



JUST A FLICK - *you change a lamp* REAL QUICK!

Lamp changing is easier and faster with this exclusive thumb-release clamp. No tools are required to open or close the cage.

Levolier® No. 21 offers LOW COST DEPENDABILITY



in 3-amp switches

Especially durable — yet inexpensive, the Levolier No. 21 switch is the quality 3 Amp "T" 125 volt switch on the market today. It features pull-chain control and 6" wire leads permanently fastened to terminals by pressure connections. The molded phenolic case measures 1" x 1¼". Will accommodate mounting thickness up to 5/16". A desirable switch to put dependability into lower amperage current control.

McGILL®

ELECTRICAL SPECIALTIES

are always a little better and **ALL** *are Underwriters' Laboratories Inspected*

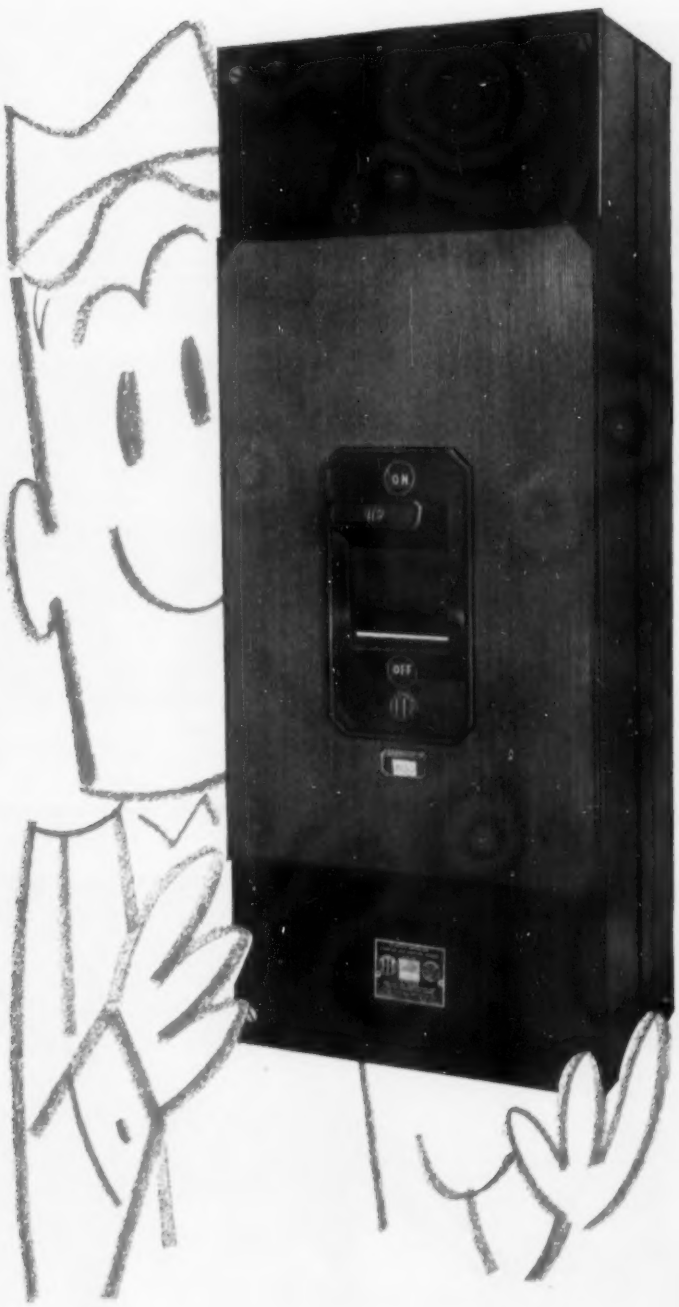


Available through leading Electrical Wholesalers

For complete information on McGill Electrical Products, write today for the new Catalog No. 84.

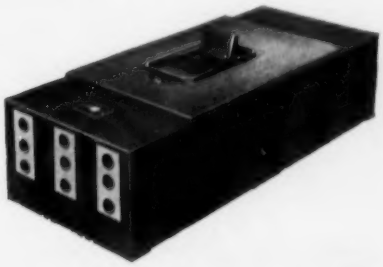
McGILL MANUFACTURING COMPANY, 450 N. Lafayette Street, Valparaiso, Indiana

NEW..."M" Frame Molded Case Circuit Breakers are fully designed for 800 ampere applications



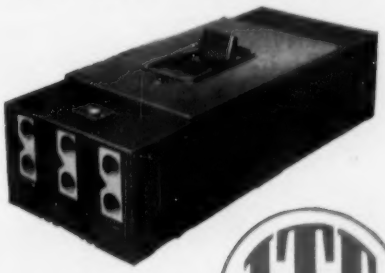
For applications which formerly required larger and more expensive equipment, you can now use the new I-T-E "M" frame molded case circuit breaker without sacrifice of quality. It offers optional pressure connectors for double or triple cable connections per phase contained within the circuit breaker case. Exclusive 3" pole center design dimensions permit easy accessibility for front cable or rear bus and stud connections. And the "M" frame breaker is ideally suited for use in panelboards, power panels, switchboards, motor controls, bus duct plugs, and individual enclosures.

Available with interchangeable trip units providing continuous 600, 700 or 800 amp ratings in 2- or 3-pole construction for 250 volt d-c and 600 volt a-c service. Interrupting ratings (NEMA test procedure): 600 v a-c, 25,000 amp; 480 v a-c, 35,000 amp; 240 v a-c, 50,000 amp; 250 v d-c, 20,000 amp. For more information, write I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa.



Triple cable connectors accommodate three 300-400 mcm cables per phase.

Optional double cable connectors accommodate two 400-500 mcm or 600-700 mcm cables per phase.



I-T-E CIRCUIT BREAKER COMPANY • **Small Air Circuit Breaker Division**

Power company saws through lays *Tiger Brand* Submarine



In she goes. Cable was orginally pulled across the lake with a jeep. The steel armor on cable took up the pulling strain.

Crew of men jockey the cable into position before cutting trench. Mr. Finch says, "We were amazed at the flexibility of the cable."



This is one of the two ice saws used for cutting the trench. It is gasoline powered, mounted on skids.



11 inches of hard ice . . . Cable without boats or barges

• The scene is Upper Saranac Lake, N. Y. Paul Smith's Electric Light & Power and Railroad Company wanted to lay a 2000-foot continuous length of Tiger Brand Submarine Cable under water. Ordinarily this would require expensive boats, barges and crews.

But Raleigh Finch, General Superintendent, decided to wait for a big freeze, saw a slot in the ice, then drop the cable to the bottom. The cable was so flexible, that it only took 15 minutes to unroll the entire 2000 feet onto the ice. The picture captions explain how the job was done.

The cable involved is 2-conductor, 5000V, #4 AWG, steel armored, rubber insulated, non-leaded. It was selected because of its flexibility, light weight and low cost. The cable joins a previous Tiger Brand Submarine Cable that was laid in 1932. According to Mr. Finch, "We haven't had a service failure in that cable since it was laid 24 years ago. In fact, we've never had a piece of Tiger Brand fail, in the 30 years that we've been using it."

Any user of electrical cable can have this same kind of reliable performance. Just switch to Tiger Brand.



AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL, GENERAL OFFICES: CLEVELAND, OHIO

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS

UNITED STATES STEEL EXPORT COMPANY, NEW YORK



A STANDARD TIGER BRAND CABLE FOR EVERY SPECIAL JOB!

- asbestos wire and cable
- mold cured portable cord
- aerial, underground and submarine cable
- shovel & dredge cable
- paper & varnished cambric cable
- machine tool & building wire
- special purpose wire & cable

USS Tiger Brand ELECTRICAL WIRE & CABLE

USS

UNITED STATES STEEL



"We Hooked it Up and Walked Away"



In the electrical signaling and communication industry this expression, coming from an electrical contractor, is the highest recommendation he can give of a manufacturer's equipment. It means "Well done! Your system installed easily and worked properly the first time. No rejects . . . no grounds or shorts . . . no trouble shooting, with all that means in running up the cost of a job. It worked like a charm!"

We're accustomed to hearing this expression quite frequently at Auth. Our equipment has always been designed to make installation easy. We give the contractor what he needs . . . wiring diagrams, equipment drawings, installation and operating instructions. All material is thoroughly tested before shipment.

Auth
SINCE 1892

We . . . at Auth. . . do this not only because it comes naturally. We do it because every time a contractor says to us "We hooked it up and walked away," we know that he'll be coming back to us on the next job. That's good will.

Manufacturers of
ELECTRICAL SIGNALING, TIME AND COMMUNICATION SYSTEMS FOR HOSPITALS, SCHOOLS, HOUSING, INDUSTRY AND SHIPS

Sold in cooperation with the distributor

Auth Electric Company, Inc.

LONG ISLAND CITY 1, NEW YORK

Ozone didn't K.O. this cable!



shock-tested for 6000 hours

U.S. ROYAL MASTER power cable still stands up!

Amazingly better than *any* of the five leading brands tested!

United States Rubber Company technicians tested U. S. Royal Master Power Cable against 5 leading competitive brands. Here's the test, and the results:

A sample of 5 KV unshielded U. S. Royal Master Power Cable and 5 other competitive cables were each bent into a U-shape, roughly 8 times overall diameter. Placed upright on a grounded metal plate, a conductor-to-plate potential of 40,000 volts was applied. All 5 competitive cables failed within 20 minutes to 35 hours. The U. S. Cable was still going strong after 6000 hours!

No other cable approaches U. S. Royal Master in performance and economy. Order cable from your distributor or write Electrical Wire and Cable Dept., United States Rubber Company, Rockefeller Center, New York 20, N. Y.

Adequate Wiring can be the two most important words in your manufacturing economy. Obsolete wiring can cause power failure, increase maintenance expenses and reduce your production. Make sure your present wiring is not only adequate for today's power needs, but also sufficient to carry the ever-increasing electrical loads required in your future growth.

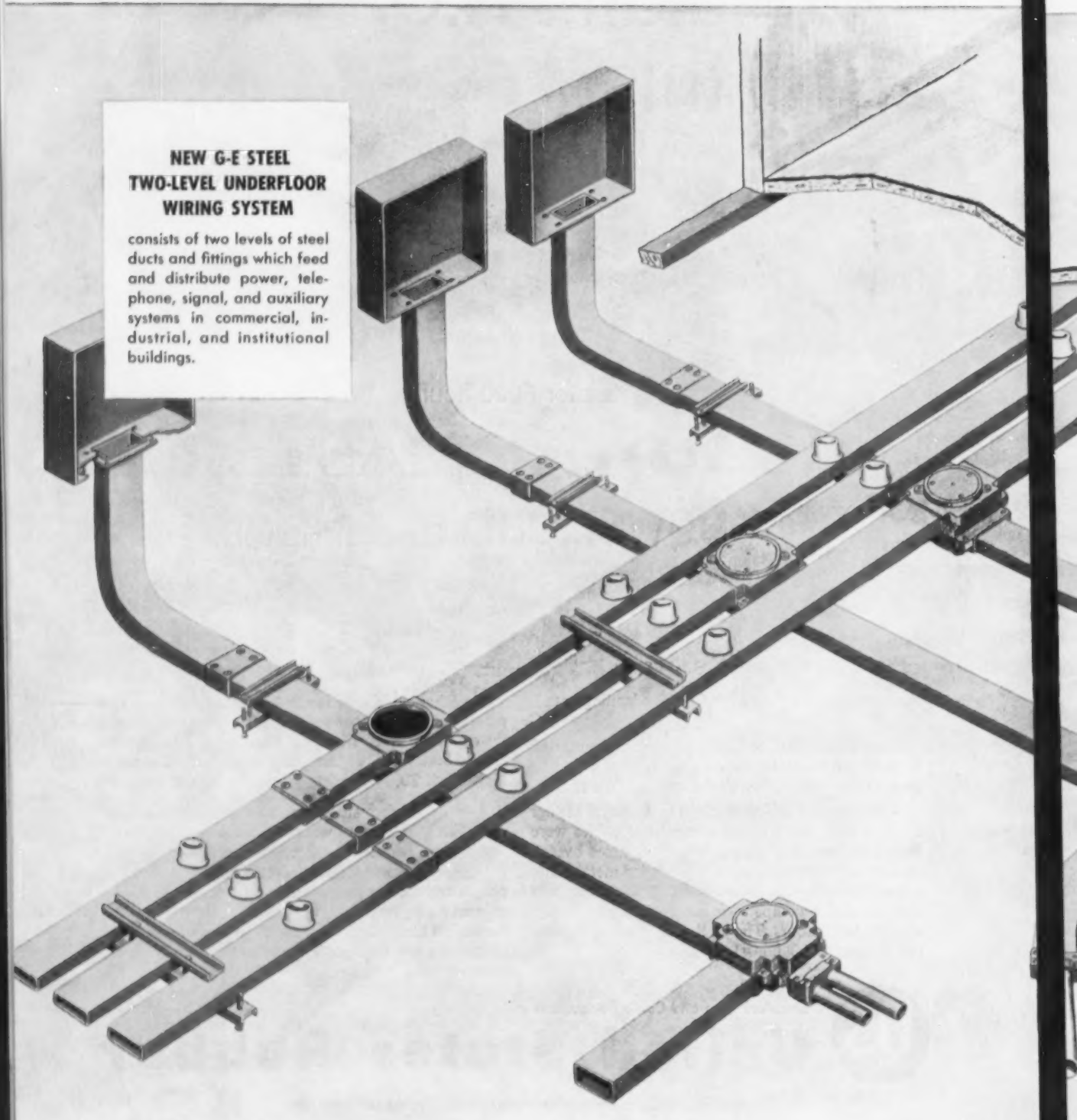
US RUBBER

Electrical Wire and Cable Department

United States Rubber

General Electric Announces

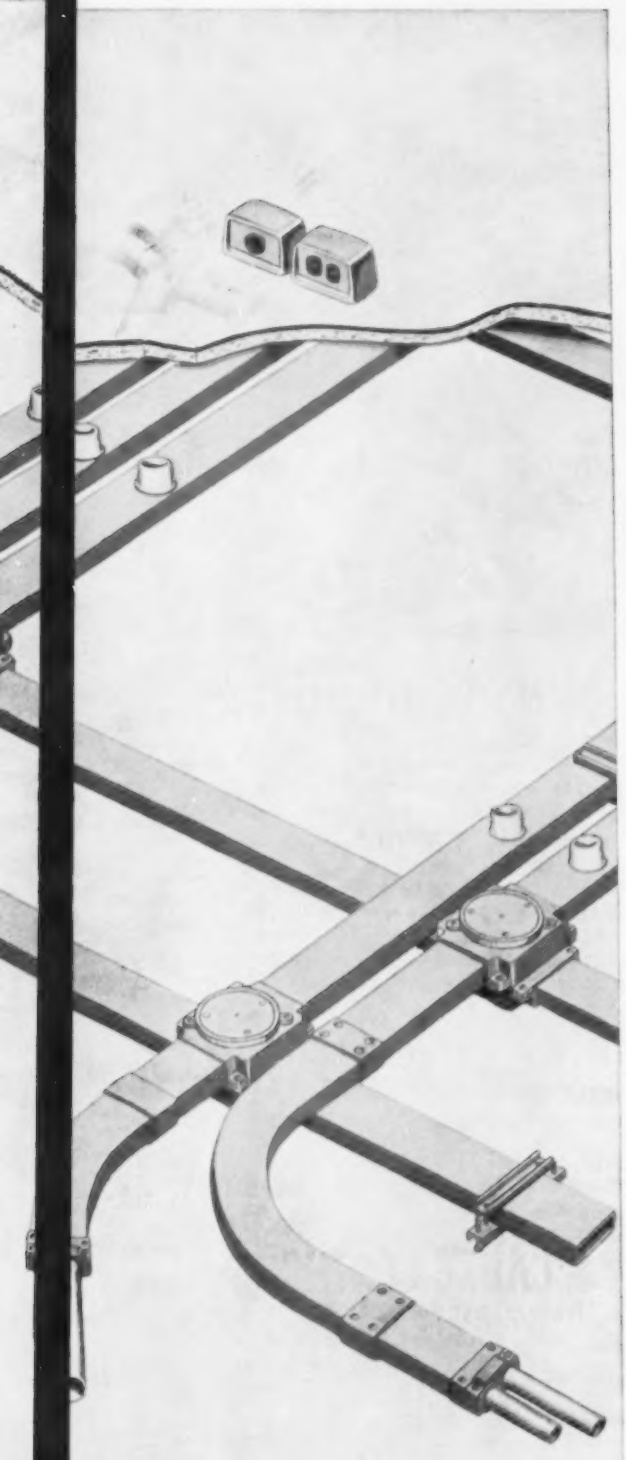
New TWO-LEVEL steel u



NEW G-E STEEL TWO-LEVEL UNDERFLOOR WIRING SYSTEM

consists of two levels of steel ducts and fittings which feed and distribute power, telephone, signal, and auxiliary systems in commercial, industrial, and institutional buildings.

el underfloor wiring system



- gives completely separate services
- permits unlimited number of duct feeds
- fits any predetermined floor layout
- allows unlimited number of services

A new two-level steel underfloor wiring system offering entirely new benefits to architects, engineers, electrical contractors, owners, and tenants has been announced by General Electric.

COMPLETE SEPARATION OF SERVICES because only single-duct junction boxes are used. Duct entrances are on two levels—usually with feeder duct below and distribution duct above. This separation allows unobstructed runs and permits conductors to be pulled straight through the boxes. No crossunders or crossovers are necessary in the new G-E two-level system.

FLEXIBILITY IN LAYOUT AND DESIGN is now possible because there are no limitations to the duct pattern in either the feeding or distribution portions of the two-level system.

ONLY ONE TYPE AND SIZE JUNCTION BOX TO INSTALL—contains no tunnels or barriers. Its entire interior is accessible for work and inspection. Wire pulling is easier and circuits are easy to trace because of two-level separation of all services.

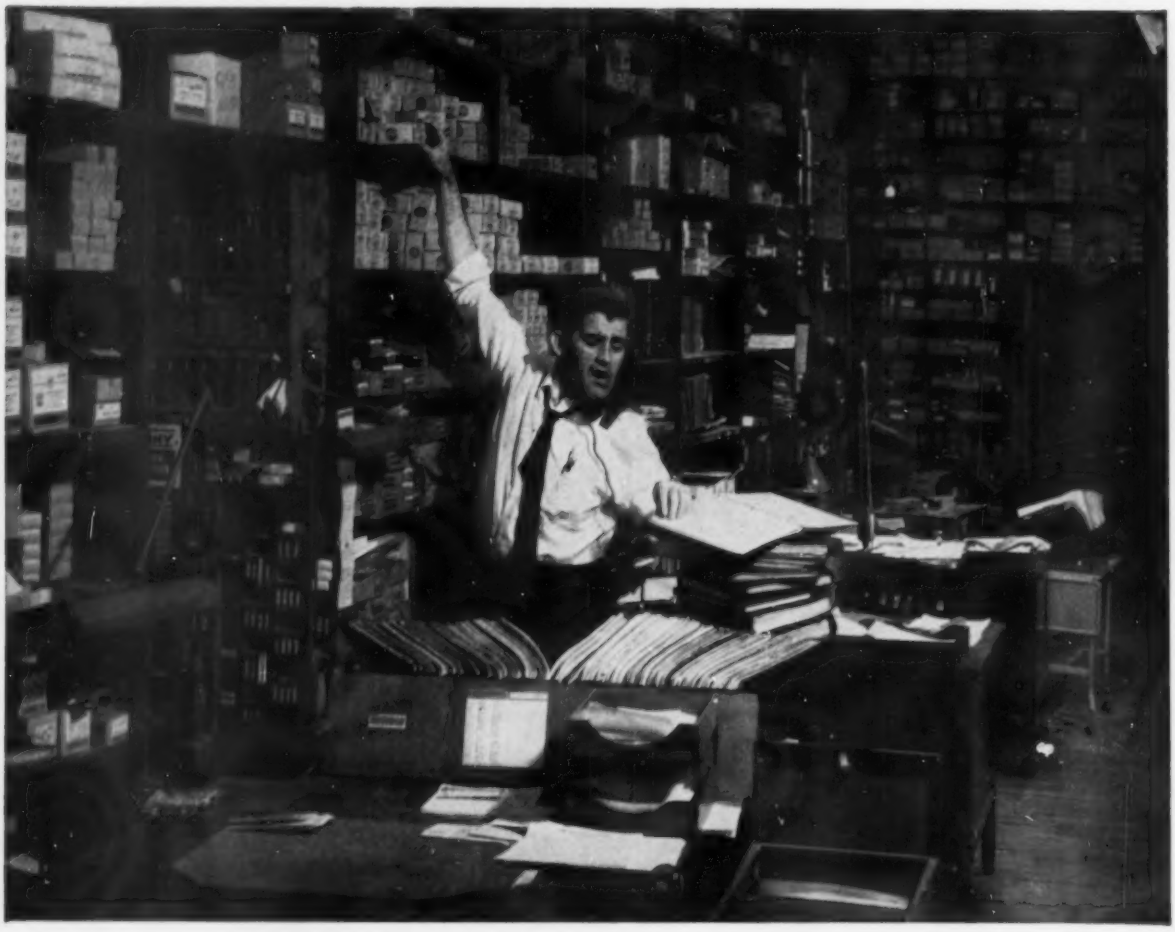
INCREASED WIRING CAPACITY is provided for by the new steel duct (4-square inches cross-sectional area).

FIND OUT how this two-level system can help you distribute power, telephone, signal, and auxiliary systems. Get in touch with your nearest G-E Construction Materials District Office or write for information bulletin to Section C59-218, General Electric Company, Bridgeport 2, Connecticut.

Progress Is Our Most Important Product

GENERAL ELECTRIC

CONDUIT PRODUCTS DEPARTMENT



This could be you—"In the Land of No Distributors."

Pictured is only a small fraction of the inventory, the catalogs, the confusion that would be *all yours* if it wasn't for the distributor! "In the Land of No Distributors"—*you* would have to carry a tremendous inventory—*and* insure it. *You* would have to collect hundreds of different catalogs, thousands of price sheets from manufacturers all over the country. What a mess!

In addition, "In the Land of No Distributors"—

- **You would go "telephone crazy" placing hundreds of calls a day to a variety of different manufacturers located miles away.**
- **You would be pestered by an army of manufacturers' salesmen.**
- **You would take the chance of getting only partial delivery—and waiting days for important equipment from "slow" manufacturers.**
- **Your "over-the-counter" purchases would be major endeavors.**
- **Your "Accounts Payable" and "Order Department" would be many times larger and more expensive than they are now because, instead of one order and one check to your distributor, you would have to make out many to your many manufacturing sources.**

That's why dependable electrical manufacturers advise you to always buy from

YOUR DISTRIBUTOR—THE BEST FRIEND YOUR BUSINESS CAN HAVE! He's the *one* source for *everything* electrical—and he's local.

It Must Be Right

The Trade Mark of TOP Quality

TRIANGLE

TRIANGLE CONDUIT & CABLE CO., INC.

NEW BRUNSWICK, NEW JERSEY

Manufacturers of Arteries for Electricity, Liquids and Gases

WIRE • CABLE • CONDUIT • BRASS and COPPER TUBE • PLASTIC PIPE



FIRE SAFETY *is our business, too!*

Dependable CLARK Fire Pump Motor Starters are on guard in thousands of buildings to help prevent disaster like that above. We have been in this business for nearly half a century and have been pioneers in the field.

CLARK Fire Pump Controls are available in non-automatic and combined automatic—non-automatic types. They are approved by Underwriters' Laboratories, Factory Mutual Association and conform to National Fire Protection Association standards. Because of this approval, CLARK Fire Pump Controllers on your systems earn the lowest possible insurance rates.

Engineering service and descriptive literature is available.

The **CLARK CONTROLLER** *Co.*

ENGINEERED ELECTRICAL CONTROL

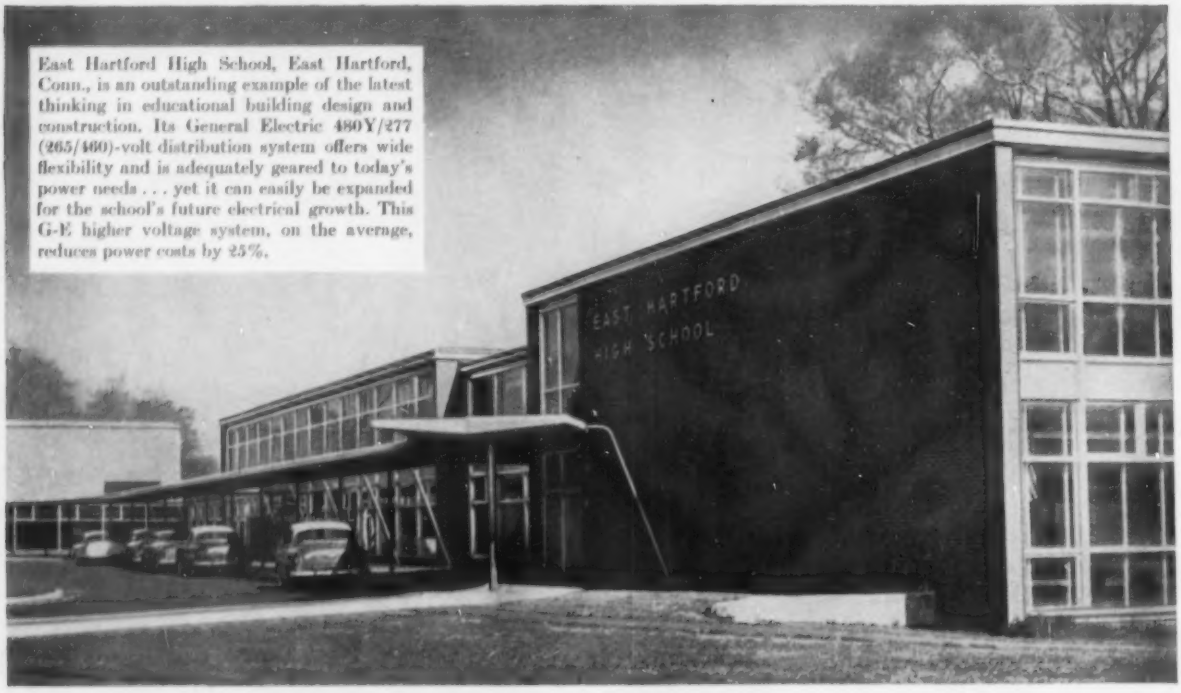
IN CANADA...CANADIAN CONTROLLERS, LIMITED

1146 EAST 152nd STREET, CLEVELAND 10, OHIO

MAIN OFFICES AND PLANT, TORONTO

"PACKAGED" DISTRIBUTION SYSTEMS HELP PUT

Here's how General Electric "System Engineered" Distribution Equipment provides more power at less cost . . . and cuts installation time and expense



East Hartford High School, East Hartford, Conn., is an outstanding example of the latest thinking in educational building design and construction. Its General Electric 480Y/277 (265/460)-volt distribution system offers wide flexibility and is adequately geared to today's power needs . . . yet it can easily be expanded for the school's future electrical growth. This G-E higher voltage system, on the average, reduces power costs by 25%.

In today's schools or factories, in commercial buildings or institutions, General Electric "System Engineered" equipment *saves from the beginning* because it is designed to work together as a completely *integrated system*. G-E equipment is built to lower original investment, to cut installation costs and to reduce on-the-job operating expense.

There are 7 *work-together* advantages inherent in all G-E "System Engineered" distribution equipment that offer benefits to both contractor *and* user.

1. True extendability because G-E standardized components are compact and accessible . . . especially designed for easy addition or relocation.

2. Easy-to-assemble. Flex-A-Power* Busways, for example, quickly bolt together, reduce labor and maintenance costs.

3. No loss when moving and reinstalling distribution equipment. "System Engineering" provides for practically 100% re-use of materials.

4. Complete relocation of loads without rewiring with G-E Flex-A-Power plug-in distribution busways.

5. Maximum electrical efficiency and minimum maintenance from components designed to work together.

6. One source of supply for all components ends procurement problems and reduces costs.

7. Skilled planning service from G-E Engineer who is selling not just components, but complete electric distribution systems to make sure your installation has a built-in future.



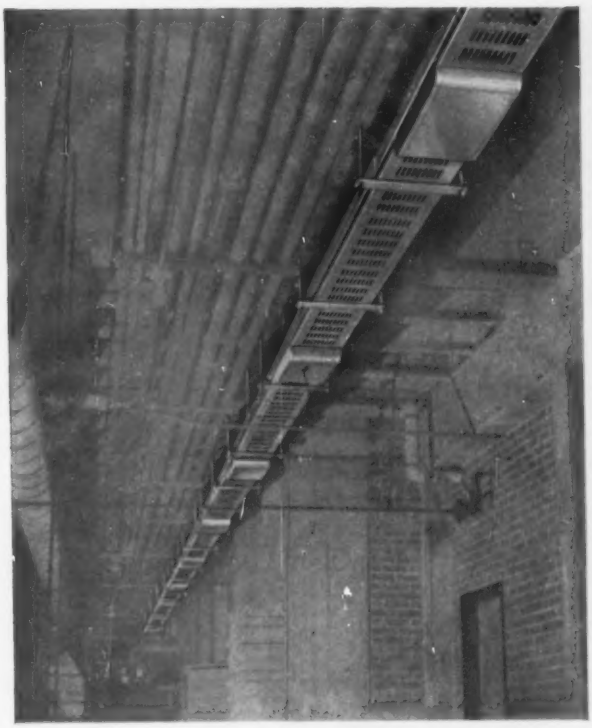
General Electric Stage Lighting Control Switchboard installed in East Hartford High School auditorium. Switchboard provides outstanding flexibility through extensive presetting and wide application of remote control.

For additional information on higher voltage distribution systems, write for General Electric's new bulletin (GEA-6223), "Modern Distribution Equipment." Address:

General Electric Company
Distribution Assemblies Department
Plainville
Connecticut

Architects—Nichols & Butterfield, West Hartford, Conn.
Consulting Engineers—Marchant & Minges, West Hartford, Conn.
General Contractor—A. F. Peaslee, Inc., Hartford, Conn.
Electrical Contractor—Theodore D. Brass & Co., Hartford, Conn.
Distributor—General Electric Supply Co., Hartford, Conn.

LID ON SOARING SCHOOL CONSTRUCTION COSTS



Busways—Flex-A-Power* Busways at East Hartford High School. These are available with either copper or aluminum bus bars, are erected easily with "building block" sections of standard lengths. Prefabricated fittings allow rapid assembly tailored to various plant contours.



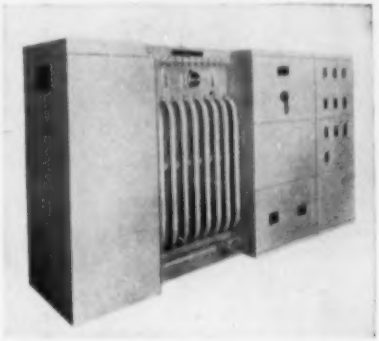
Stage Lighting Switchboards—Both mechanical and electronic types are available to exacting specifications for schools, TV studios, auditoriums and theaters. Dead-front construction provides maximum safety of operation, even for non-professionals. Easy-to-use controls. Factory pre-wired.



Control Centers—New G-E Type DA7093 motor control center with short-circuit rating of 50,000 amperes occupies 50 percent less floor space than conventional equipment. Standardized, self-supporting.



Panelboards—Types NAB, NHB, NLTQ, NLTQX, NTP, and NTC for lighting; Types NCB, CCB, Swing-Wa* and Converti-Fuse* panelboards for power distribution. Full line. Factory assembled.



Sectional Type Distribution Center Unit Substations—Factory assembled to reduce installation cost. Short secondary feeders in load center system mean low voltage drop. Easy-to-order arrangements.

*Registered Trade-mark of General Electric Company

Progress Is Our Most Important Product

GENERAL ELECTRIC

OSTER

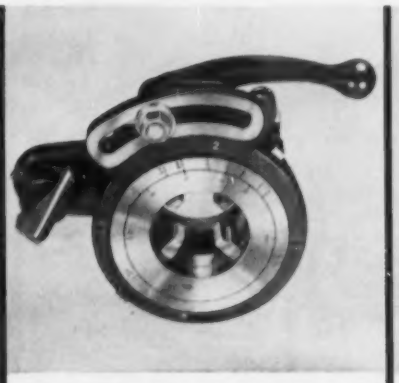
NO. 552
PIPE MASTER

"Cuts hand-threading time 86% on 2″ pipe!"

COSTS ONLY $425.00



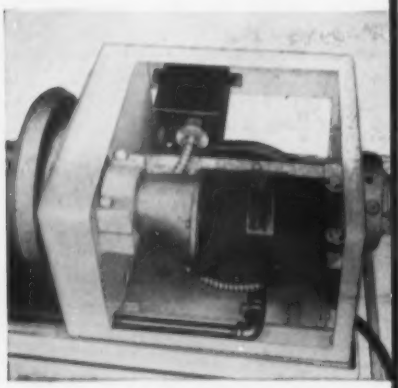
1 "Best investment we've ever made! No wonder it cut my complete handling time on 2" pipe from 7 minutes to less than one minute. Look at some of these Oster features . . .



2 "This adjustable quick-opening die head, for example, takes me less than a minute to adjust for *any* size pipe within the ½" to 2" standard range.



3 "And this exclusive, patented 'Auto Grip' Chuck. A spin of the wheel and the pipe is centered perfectly — gripped tightly—without using bar or chuck wrench.



4 "Just take a look at this powerful heavy-duty motor—the big reason behind Oster 'Pipe Master' performance. Universal, geared-head type—reversible, variable speed.



5 "Optional equipment, but well worth its cost, is this handy stand that makes it easy to move the No. 552 anywhere I want to use it. Look at those big rubber-tired wheels."

. . . everything you could want in a Portable Pipe Machine!

86% reduction in hand-threading time on 2″ pipe is just one of the interesting money-saving facts contained in the Oster No. 552 Pipe Master Profit Prover! Do you know, for example, that if you cut only 36 threads a day on the Oster Pipe Master, your machine probably will pay for itself in only 53 days?

Write *today* for your FREE copy of the Oster No. 552 Pipe Master Profit Prover. See for yourself the tremendous difference in time and money between hand threading and power threading the quick and easy Pipe Master way.



THE

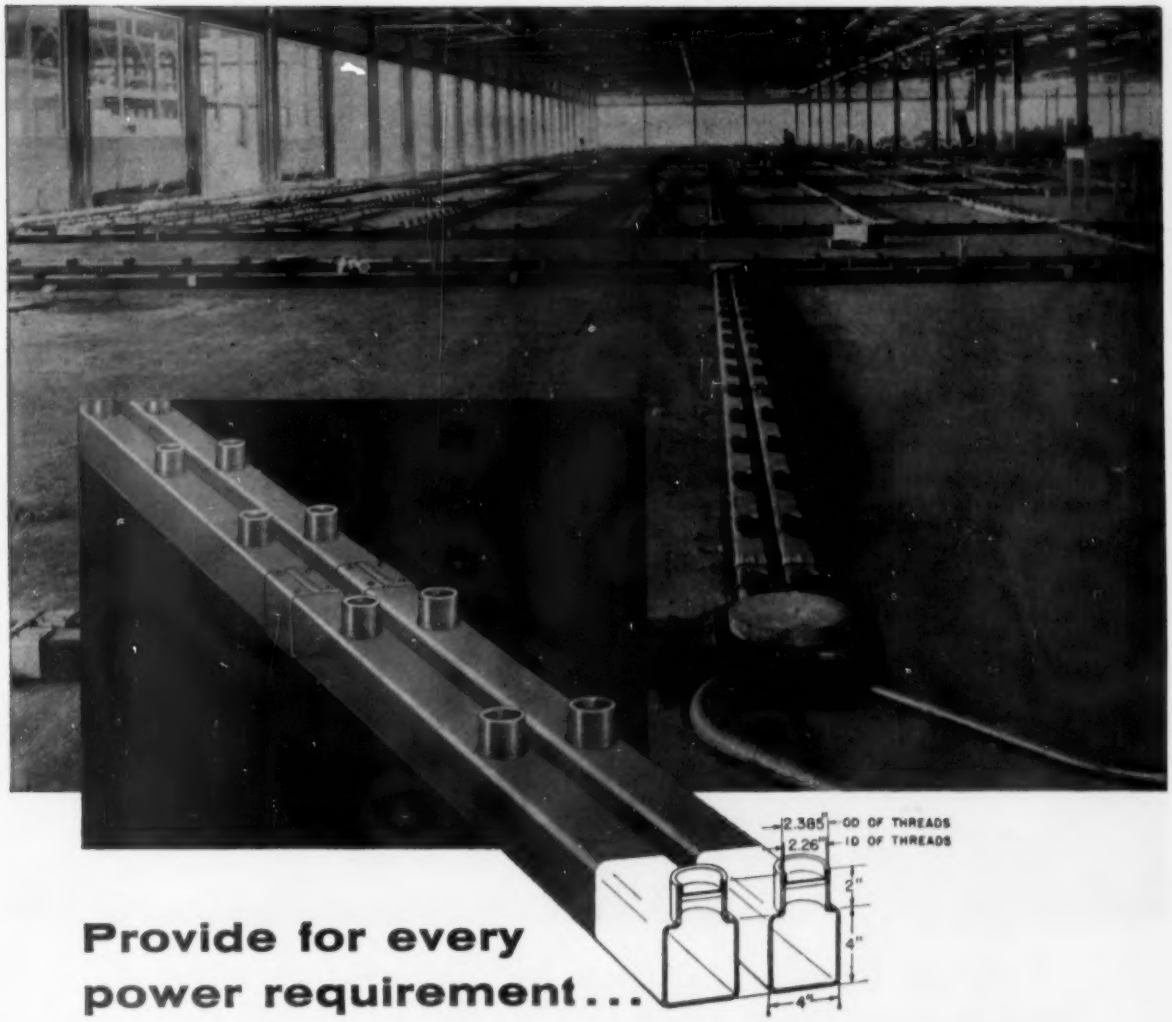
OSTER

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Main Office & Factory

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INDUSTRIAL UNDERFLOOR ELECTRICAL RACEWAYS

Versatile in design, National Electric Jumboduct offers plenty of capacity for production line wiring . . . eliminates the hazard of overhead wiring . . . permits flexible, attractive plant layouts by providing for readily accessible electrical distribution in the floor at a minimum cost.

A Jumboduct system in your plant means:

Plenty of capacity

4″ x 4″ Cross Section—more room for wires

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2″ pipe threaded outlets every 24″ permits exact location of equipment

Low Cost

- Easy-to-handle 10′ lengths
- Same simple installation procedure as standard Nepcoduct
- Quick access to inserts
- Investment in conductors limited to today's needs with ample space for tomorrow's additions

Safety

- Protected against corrosion by Sherardizing
- Coated with a baked-on acid-resisting enamel
- A completely grounded all-steel system

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National Electric Products

PITTSBURGH, PA.

3 Plants • 10 Warehouses • 36 Sales Offices



High Level Lighting for Faster Learning... with Lighting by **LITECONTROL**

Better lighting helps young minds learn faster, more comfortably in this remodeled Harrisburg, Pa., school. Both the original building (above) and the new wing now have their classrooms entirely lighted by LITECONTROL.

LITECONTROL fixture No. 6628 gives plenty of high intensity, low brightness illumination everywhere. Efficiency is an unusually high 86%. Light through the top of the fixture cuts fixture-ceiling contrast and helps minimize glare.

Two-piece construction means installation is fast and simple, whether the units are hung individually or in continuous rows. Maintenance is easy, too: baffles swing fully open from either side without the use of tools. Fixtures may be cleaned and relamped in seconds.

Whether your job is lighting or relighting, for a custom installation at standard fixture prices, get in touch with LITECONTROL. Call or write your local representative.

INSTALLATION: Hamilton Elementary School, Harrisburg, Penna.

ARCHITECT: Clayton J. Lappley, Harrisburg, Penna.

ENGINEER: Snyder & Van Horn, Harrisburg, Penna.

ELEC. CONTRACTOR: The Howard P. Foley Company, Harrisburg, Penna.

FIXTURE: Litecontrol No. 6628 and 6624, pendant mounted.

INTENSITY: New rooms (with fixtures hung on 8" stems), average 52 footcandles initially on desks.

Old rooms (with fixtures hung on 24" stems), average 47 footcandles initially on desks.

LITECONTROL *Fixtures*

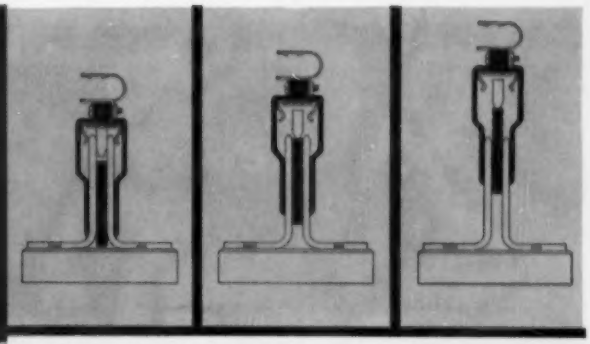
KEEP UPKEEP DOWN

LITECONTROL CORPORATION, 36 Pleasant Street, Watertown 72, Massachusetts

DESIGNERS, ENGINEERS AND MANUFACTURERS OF FLUORESCENT LIGHTING EQUIPMENT DISTRIBUTED ONLY THROUGH ACCREDITED WHOLESALERS



The Vacu-Break action is shown by a manually actuated demonstration model of a switch-head. A section of the arc-restricting chamber has been cut away to picture the operation.



1. "ON" POSITION—head has been thrust down on stationary line and load contacts. Contacts engage a self-aligning copper slug, completing circuit and reinforced by the Clampmatic pressure spring to assure a bolt-tight contact.

2. SWITCHING TO "OFF"—head is carried swiftly upward by operating bail, aided by Clampmatic® pressure springs. Arcs are smothered instantly because oxygen and ionizable gas in chamber are restricted.

3. FULL "OFF" POSITION—stationary line and load contacts are completely covered and remain in slots of chamber, assuring positive alignment and maximum safety. Chamber also acts as seal against dust and dirt.

Switch to Clampmatic Vacu-Break

FOR GREATER SAFETY AND LONGER SWITCH LIFE

Famous BullDog principle restricts arcing, increases product life!



Recommend a switch to Vacu-Break®! To you, it offers a way to provide the finest equipment. To your customer, it means money saved through elimination of costly maintenance! Vacu-Break is the exclusive principle which has won BullDog safety switches, bus plugs, power-panels and switchboards an enviable reputation for superior performance and safety.

In these and other BullDog products, it's the unique Vacu-Break action which smothers arcs. It eliminates the maintenance ordinarily caused by excessive arcing . . . and with it the high cost of "upkeep"! Products employing the Vacu-Break principle give the kind of service that adds to your own reputation.

It's just one more demonstration of BullDog's ability to provide electrical products which offer advantages in installation, convenience, safety and flexibility.

Consult your qualified distributor, BullDog field engineer or write: BullDog Electric Products Company, Detroit 32, Michigan.

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IF IT'S NEW... IF IT'S DIFFERENT... IF IT'S BETTER... IT'S

BULLDOG

ELECTRIC PRODUCTS COMPANY

A Division of I-T-E Circuit Breaker Company

Export Division: 13 East 40th Street, New York 16, N. Y. • *In Canada:* BullDog Electric Products Co. (Canada) Ltd., 80 Clayson Road, Toronto 15, Ont.

G-E LAMPS GIVE YOUR CLIENTS MORE FOR ALL THEIR LIGHTING DOLLARS



How uniform life, light, and freedom from defects in G-E lamps save your clients—and you—money

WHEN you finish a lighting installation, your job is finished—*unless* you have trouble-shooting call-backs. Uniform high-quality lamps can do a lot to keep your call-backs to a minimum. They also help keep down your client's operating costs—costs that are 10 times his lamp costs.

The photo above shows the life test—one of hundreds of tests, checks and inspections performed on hundreds of thousands of General Electric lamps every year. In terms of lamp performance, this means you—and your client—get:

UNIFORM LIFE—Saves time and money. 99 out of 100 General Electric 40-watt fluorescent lamps will last more than a year in single-shift plants (2500 hours service)! 98 out of 100 will still be in service after a year's service in double-shift plants (4000 hours service)!

UNIFORM LIGHT OUTPUT—Your client gets all the light he pays for. Less than 1% of all G-E 40-watt fluorescent lamps are as much as 5% below the published rating of 2500 lumens. And in tests covering 18 months, these lamps have averaged 39 watts. That's 64 lumens per watt!

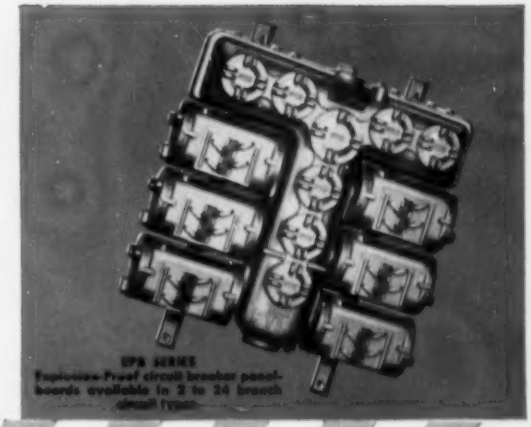
FREEDOM FROM DEFECTS—You save installation time, and your client cuts maintenance costs. 99.9% of General Electric 40-watt fluorescent lamps are free from defects that will affect performance in service.

Isn't it good business for you to install uniform-performance G-E Lamps on *your* lighting jobs? General Electric Company, Large Lamp Dept., Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

SPECIFY...
PYLETS®



FOR HAZARDOUS LOCATIONS



Second to none for...

SAFETY: Explosion-proof and dust-tight PYLETS *exceed* code requirements and provide maximum protection for personnel and property against fire and explosion.

ECONOMY: PYLETS are designed for quick, easy installation and convenient maintenance. Rugged construction insures a long service life.

- TAPER TAPPED HUBS
- SMOOTH, ROOMY INTERIORS
- QUICK ACTING JOINTS
- DEPENDABLE MECHANISMS
- ALUMINUM ALLOY OR HEAVY CADMIUM PLATED FERROUS ALLOY CASTINGS

SINCE 1897

THE PYLE-NATIONAL COMPANY

WHERE QUALITY IS TRADITIONAL

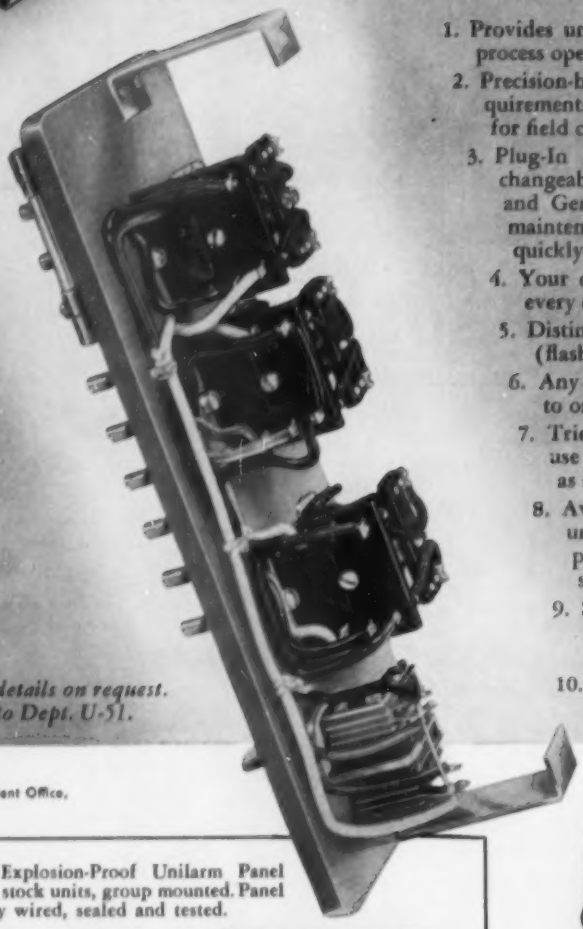
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CIRCUIT CONTROLS • PLUGS AND RECEPTACLES • LIGHTING FIXTURES • FLOODLIGHTS

No Other Alarm System Has ALL The Advantages Of

R&S UNILARM*...



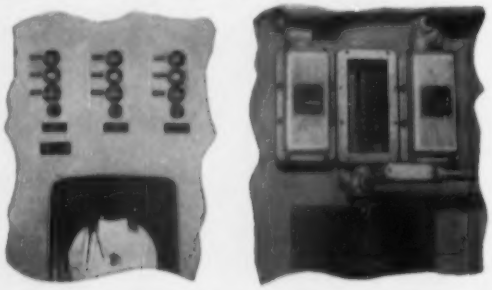
1. Provides unfailing supervision of equipment and process operations.
2. Precision-built to Underwriters' Laboratories requirements. Completely wired and tested . . . ready for field connections.
3. Plug-In Panel (large illustration), fits interchangeably into Explosion-Proof, Vaportight and General Purpose enclosed units. Reduces maintenance to a minimum . . . easily and quickly replaced with a spare unit.
4. Your choice of 100 standard circuits to suit every conceivable application.
5. Distinctive visual signal for each condition (flashing light) insures immediate attention.
6. Any number of Unilarms may be connected to one audible signal.
7. Tried and tested in the field. Thousands in use giving trouble-free protection. Accepted as standard by leading industries.
8. Available as individual unit or in multi-unit Panels. Also time delay types for applications subject to high surge or excessive vibration.
9. Saves space, engineering costs, installation and maintenance over other alarm systems.
10. Acknowledgement-test switch permits periodic testing of each Unilarm circuit.

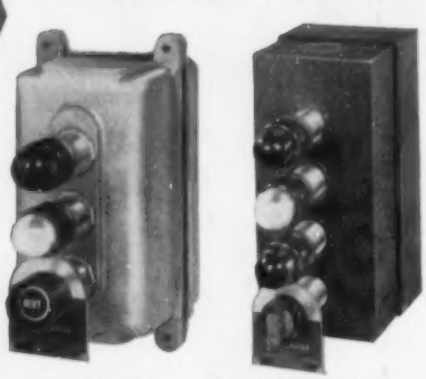
Complete details on request. Write to Dept. U-51.

*Reg. U.S. Patent Office.

D1

Special Explosion-Proof Unilarm Panel showing stock units, group mounted. Panel is factory wired, sealed and tested.





Vaportight Unilarm *General Purpose Unilarm*

R&S Unilarm is also available in a complete line of Surface Mounted Types — Explosion-Proof, Vaportight and General Purpose.

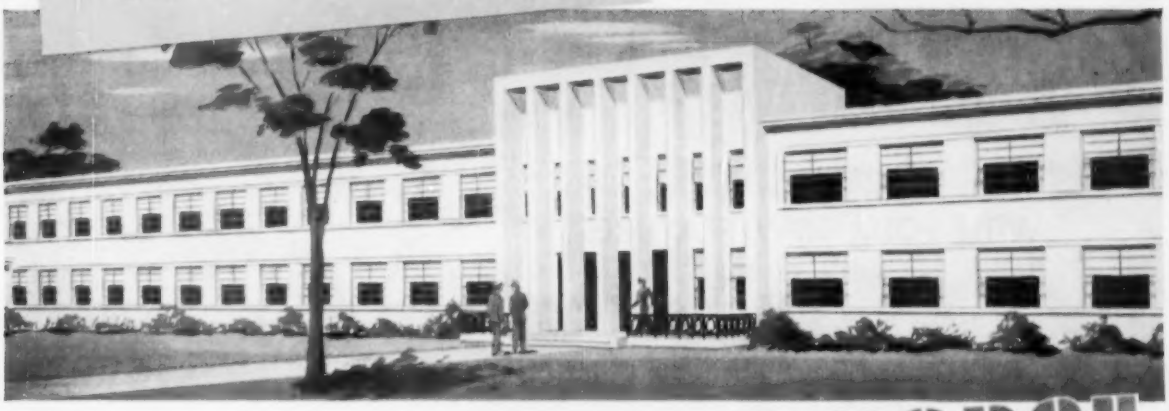
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PRECISION-BUILT ELECTRICAL EQUIPMENT—SINCE 1902



New Buildings for USAF Air University...



WIRE BY PHELPS DODGE

Shown above are two of the four buildings recently finished for the Air Command and Staff School—largest school for the advanced education of Air Force officers—of the United States Air Force's Air University, Maxwell Air Force Base, Montgomery, Ala.

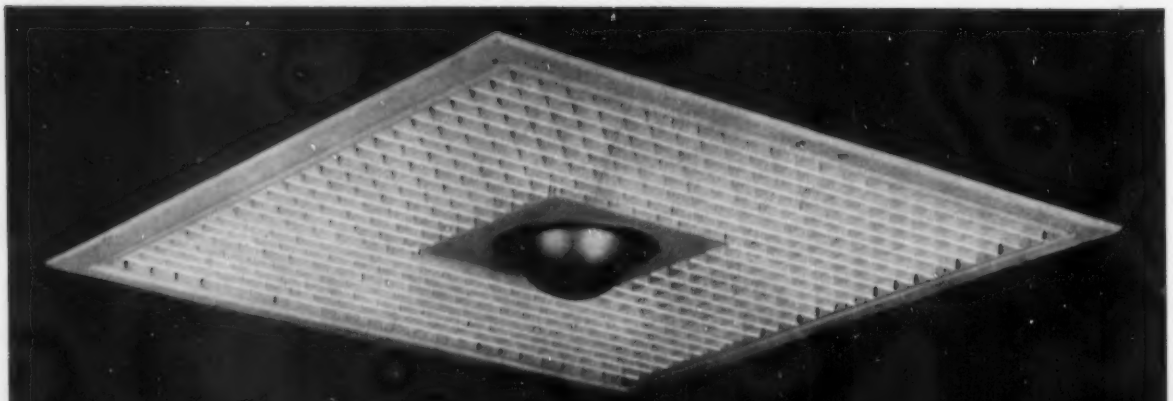
Reliable, long-life Phelps Dodge wire and cable, including Habirduct-Habirprene and Habirite-Habirprene, were specified and installed throughout all four buildings, which form the academic center of the famous Air Command and Staff School, to assure complete wiring satisfaction and trouble-free service.

* * *

On every wiring job, large or small, where top quality materials, expert workmanship and experienced "know-how" are called for, *it pays to rely on Phelps Dodge and your Phelps Dodge distributor!*

PHELPS DODGE COPPER PRODUCTS CORPORATION

SALES OFFICES: Atlanta, Birmingham, Ala., Boston, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Fort Wayne, Greensboro, N. C., Houston, Jacksonville, Kansas City, Mo., Los Angeles, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Ore., Richmond, Rochester, N. Y., San Francisco, St. Louis, Seattle, Washington, D. C.



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ALL NEW **Skylike** FOR 1956
THE MODULAR SILVERED BOWL INCANDESCENT LUMINAIRE

WITH FOUR NEW FEATURES

- All units are **PRE-WIRED**
- All units are **COMPLETELY ASSEMBLED**
- New construction provides **EASIER INSTALLATION**
- One basic unit for any type of ceiling construction

AND WITH THIS ADDED...

Skylike is now lower in cost

To meet increasing demands, Skylike has developed new production techniques making possible vastly improved units and lower costs. These advantages are being passed directly on to users. For complete detail write to...

SKYLIKE---THE **FIRST** AND **FINEST** IN MODULAR SILVERED BOWL INCANDESCENT LIGHTING

SKYLIKE LIGHTING, INC.
A SILVRAY ASSOCIATED COMPANY
Bound Brook, New Jersey — RKO Bldg., New York 20, N. Y.

Does your maintenance crew spend Sundays servicing metalclad switchgear?

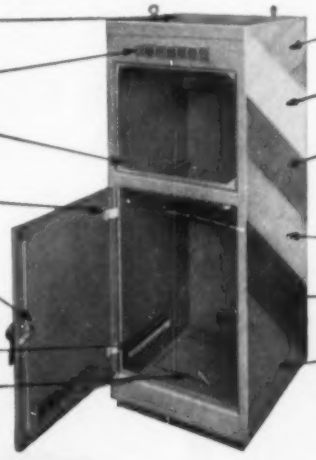


WHEN HIGH VOLTAGE switchgear gets rusty, power must be cut off for repairs and repainting. That means service work must be done on overtime, when the plant is not operating.

S&C believes that metalclad switchgear should be out of sight and out of mind—except on those rare occasions when it operates as a protective device, or when switching is necessary. The extent to which S&C goes to prevent rust and avoid switchgear maintenance is illustrated below. Only a detail? Perhaps . . . but a mighty BIG detail when less careful engineering can cause avoidable service work.

Here Is WHY S&C Metalclad Switchgear Resists Rust and Reduces Maintenance Costs

- Inside of top is coated with Insulmat ® to prevent condensation.
- Louvers are placed to provide free air circulation.
- Before welding, lapped and butted surfaces are zinc coated, eliminating bare surfaces which might rust.
- Hinges and edges, as well as bolt and latch holes, are zinc coated to assure protection of hidden surfaces.
- Hinge pins are stainless steel. Hinges, door locks, and other ferrous working parts are galvanized.
- Strip heaters prevent condensation.
- Underneath, surfaces are coated with water-repellent Texacote® to provide protection against ground moisture.



- Cold-rolled steel makes a scale-free, oxide-free base.
- All welds and sharp edges are ground smooth.
- Surfaces are thoroughly phosphatized to remove grease and provide a neutral, rust-resistant surface that assures good bonding.
- Zinc coating prevents rust from spreading in case surface is scratched.
- To make a good bond, zinc chromate is used for the prime coat.
- Finish coat is a new melamine-alkyd-urea synthetic applied by the hot-spray method and oven-baked at 375°. It has a thickness equal to four coats of conventional enamel or lacquer.

S&C

Specialists in High-Voltage Switchgear for Electric Utilities since 1910

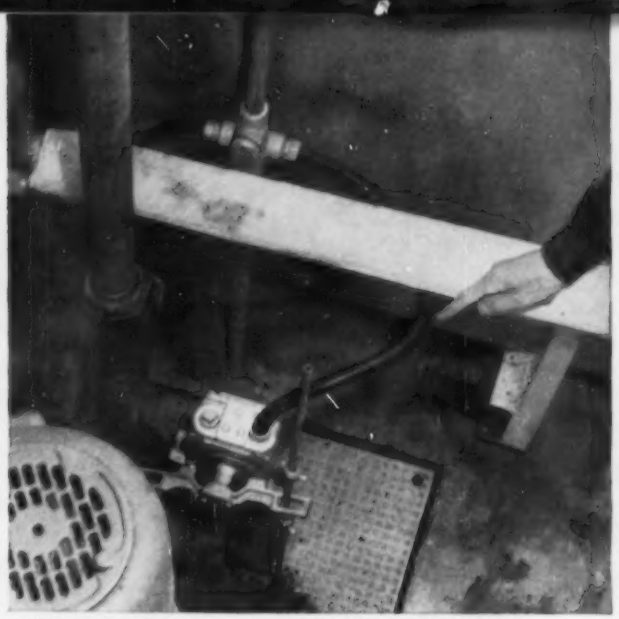
S&C ELECTRIC COMPANY

4433 RAVENSWOOD AVENUE • CHICAGO 40, ILLINOIS, U.S.A.

Consult your telephone directory. Sales offices in Birmingham, Boston, Buffalo, Chicago, St. Louis, Cleveland, Dallas, Dearborn, Denver, Houston, Huntington, Indianapolis, Jersey City, Kansas City, Little Rock, Memphis, Minneapolis, New Orleans, Philadelphia, Pittsburgh, Portland (Ore.), St. Petersburg, Salt Lake City, San Francisco, San Gabriel (Los Angeles), Seattle, Syracuse, Washington, D. C. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario.



ON DOCK, wiring to salt water motor receives 100% protection by 1¼-inch Sealtite—despite vibration, sun, salt air and oil.



OUTDOOR MOTOR pumps water at 212°F from cookers. Sealtite shows no effects from weather and constant steam.

CANNING COMPANY FINDS—

Salt water atmosphere that corrodes metals can't hurt Sealtite flexible, liquid-tight conduit

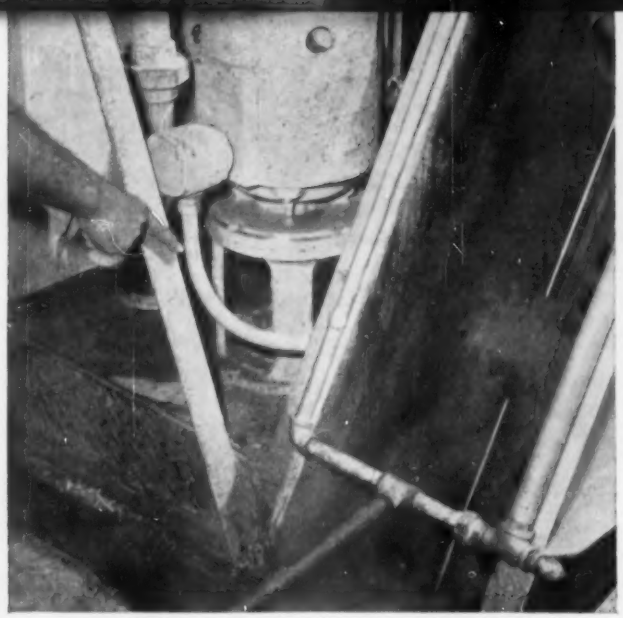
Chicken Of The Sea, Inc. ends conduit failures due to salt water, fish slime, and steam—with Sealtite. Cuts replacement costs and down-time!

SEALTITE CUT INSTALLATION COST all around the plant. Saved company time it takes to cut, bend and fit rigid conduit.



HEAVY VIBRATION of packer machine is absorbed by Sealtite. Also simplified meeting of misaligned outlets.





IN CONSTANT VIBRATION, Sealtite also withstands fish slime and scraps, and wash-down with strong detergents.



STEAM BATH envelopes Sealtite so that it is almost concealed. But no shutdown needed for repairs. Sealtite keeps production going.

Sealtite's tough polyvinyl chloride jacket – extruded over flexible metal core – actually ignores corrosive chemicals, salt water, dirt and grime that often shorten ordinary conduit life.

Thus more and more manufacturers – like Chicken Of The Sea, Inc. – are using Sealtite* flexible, liquid-tight conduit *all around* the plant – to protect wiring outdoors and in... in wet spots, dusty spots, corrosive spots; where wiring must flex or be moved; to absorb vibration; to meet misaligned outlets; and to speed compound bend installations in cramped spaces.

TYPE U.A. is approved by Underwriters' Laboratories for service in wet spots. Copper conductor wound spirally inside conduit for positive ground.

TYPE E.F. is extra flexible. Ideal for machine tool and other applications. Meets J.I.C. standards. Available in machine tool light gray at no extra cost from mill stocks.

Where to buy

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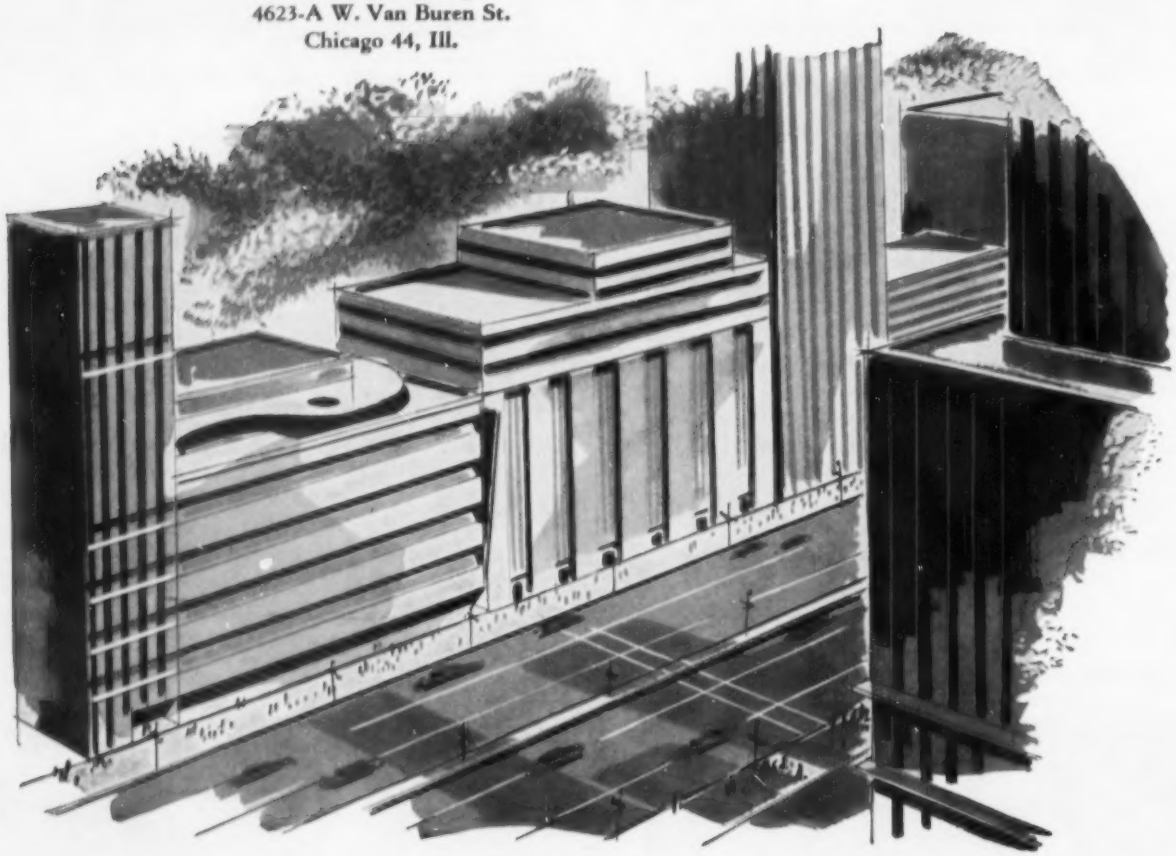
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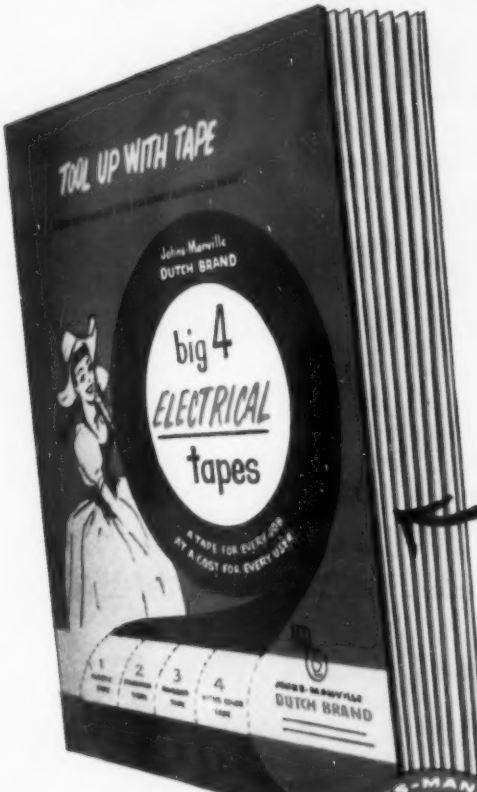
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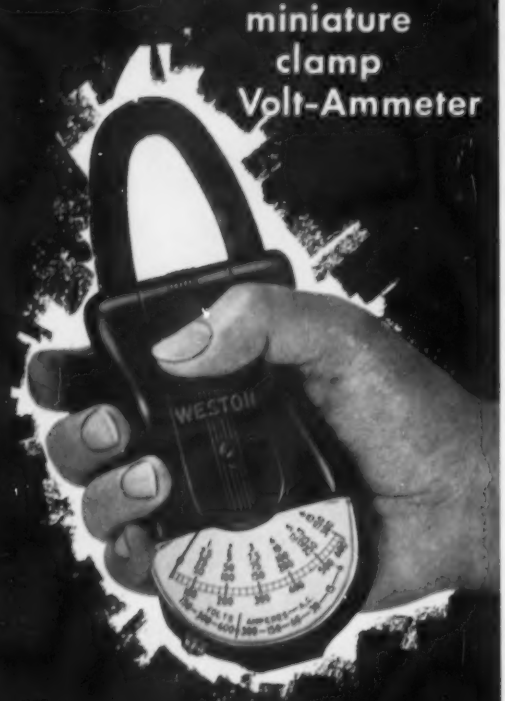
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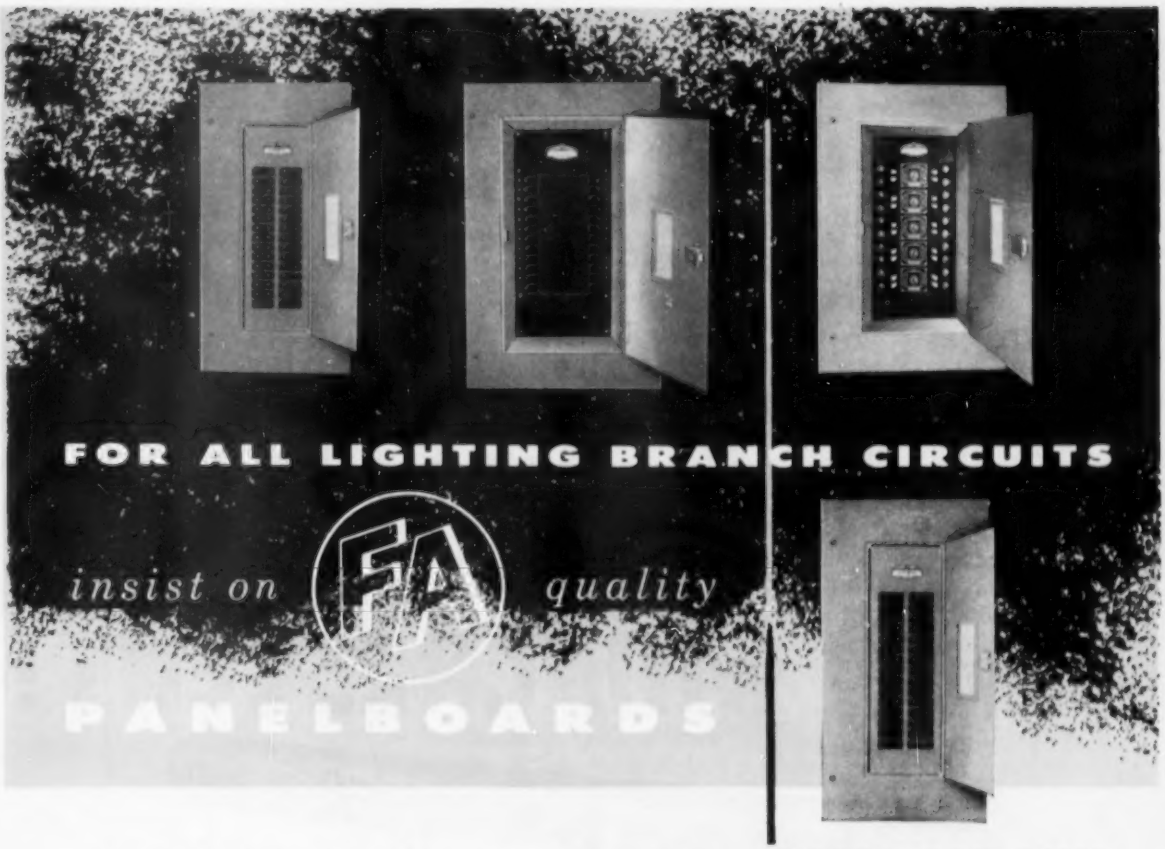
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OHMS RANGE	CENTER SCALE	FULL SCALE
R x 1	25	1,000
R x 10	250	10,000
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FA Lighting Panelboards are of two types — the Circuit Breaker and Switch and Fuse virtually all have been specifically designed to make additions of circuits and changes in capacities an easy task. Another popular feature is that virtually all are of the panel base assembly type which means all components are packaged for quick, easy assembly on the job.

Capacities of the Circuit Breaker type are 10, 15, 20, 30, 40, and 50 amps., 4 to 42 poles with main lugs or circuit breaker, 3 wire single phase or 4 wire, three phase. Switch and Fuse capacities are 30 amps., 8 to 40 S. P. circuits with main lug or safety type main fuse disconnect for 3 wire single phase, 115/230 volts and 4 wire three phase, 120-208 volts. All circuit breaker and switch and fuse units are of the quick make and quick break type.

Insist on FA Panelboards for all lighting branch needs. Contact your nearest FA representative listed in Sweet's for further information.

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QP QUICKLAG P, a plug-in thermal-magnetic circuit breaker type. Features FA QP Quicklag P circuit breakers which provide safe, dependable protection against service interruptions caused by harmless, momentary overloads, short circuits or severe overloads. Screwless assembly, pressure type connection between circuit breaker and bus bar and sequence bussing are other features.

QS QUICKLAG S, a thermal magnetic circuit breaker type with screw connection to bus bar. Features QS Quicklag S Circuit Breaker with trip free handle for protection against momentary or abnormal overloads and short circuits.

TM, a thermal-magnetic circuit breaker type with FA design magnetic blowout. Trip-free handle of FA T-M circuit breaker provides automatic circuit protection against harmless, momentary overloads, short circuits and severe overloads.

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The wiring in the average structure to-day is entirely inadequate for the load required by many new electrical appliances.

What Can Be Done About It?

Rewire with CRESCENT!



TYPE TW BUILDING WIRE

GET GREATER CURRENT CARRYING CAPACITY IN THE SAME CONDUIT

Many building owners do not realize the need for more adequate wiring of their property. The electrical contractor can offer a real service by recommending the rewiring of existing circuits with CRESCENT SYNTHOL TYPE TW BUILDING WIRE. As shown by examples to the right, this considerably increases the current-carrying capacity.

It means business for YOU!

½" CONDUIT		¾" CONDUIT	
			
ORIGINAL INSTALLATION (Wires already in)	REWIRED (As permitted by N.E.C.)	ORIGINAL INSTALLATION (Wires already in)	REWIRED (As permitted by N.E.C.)
3 conductors of # 12 wire with maximum current rating of	Will permit installation of 3 conductors of #8 CRESCENT SYNTHOL TYPE TW WIRE, thereby doubling the maximum current carrying capacity in the same existing conduit to	3 conductors of # 10 wire with maximum current rating of	Will permit installation of 3 conductors of #6 CRESCENT SYNTHOL TYPE TW WIRE, thereby increasing the maximum current carrying capacity in the same existing conduit to
20 AMPS.	**40 AMPS.**	**30 AMPS.**	**55 AMPS.**

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OVER 70 YEARS EXPERIENCE
CRESCENT INSULATED WIRE & CABLE CO.
TRENTON, NEW JERSEY

ELECTRICAL CONSTRUCTION AND MAINTENANCE

55th Year—FEBRUARY • 1956

Don't Rewire—Modernize!

Powerful consumer promotional efforts will be building a high level of public interest in home wiring systems in the coming months. Residential electrical modernization is due to become the most-talked-about aspect of the electrical contractor's business.

Electrical contractors, consequently, are going to be talking to a lot of new potential customers, people who will not be familiar with the special jargon of the trade. And until we learn to watch our language we are going to be wondering why hot prospects for "modernization" do a quick freeze when we talk about "rewiring".

Over the years, the industry has come to use the term "rewiring" in a loose, catch-all sense covering almost any alterations or additions to an existing system. We talk of "modernization" and "rewiring" as though they meant the same thing. Editors are as guilty as anyone else. So long as the term stays in the family it causes no misunderstanding.

But all these new potential customers cannot be quickly instructed in our special meanings and there is a substantial risk that they will take us at **our** word, but as **they** understand it. They will conjure up visions of extensive cutting and patching, of torn-up floors, and the costs of redecorating.

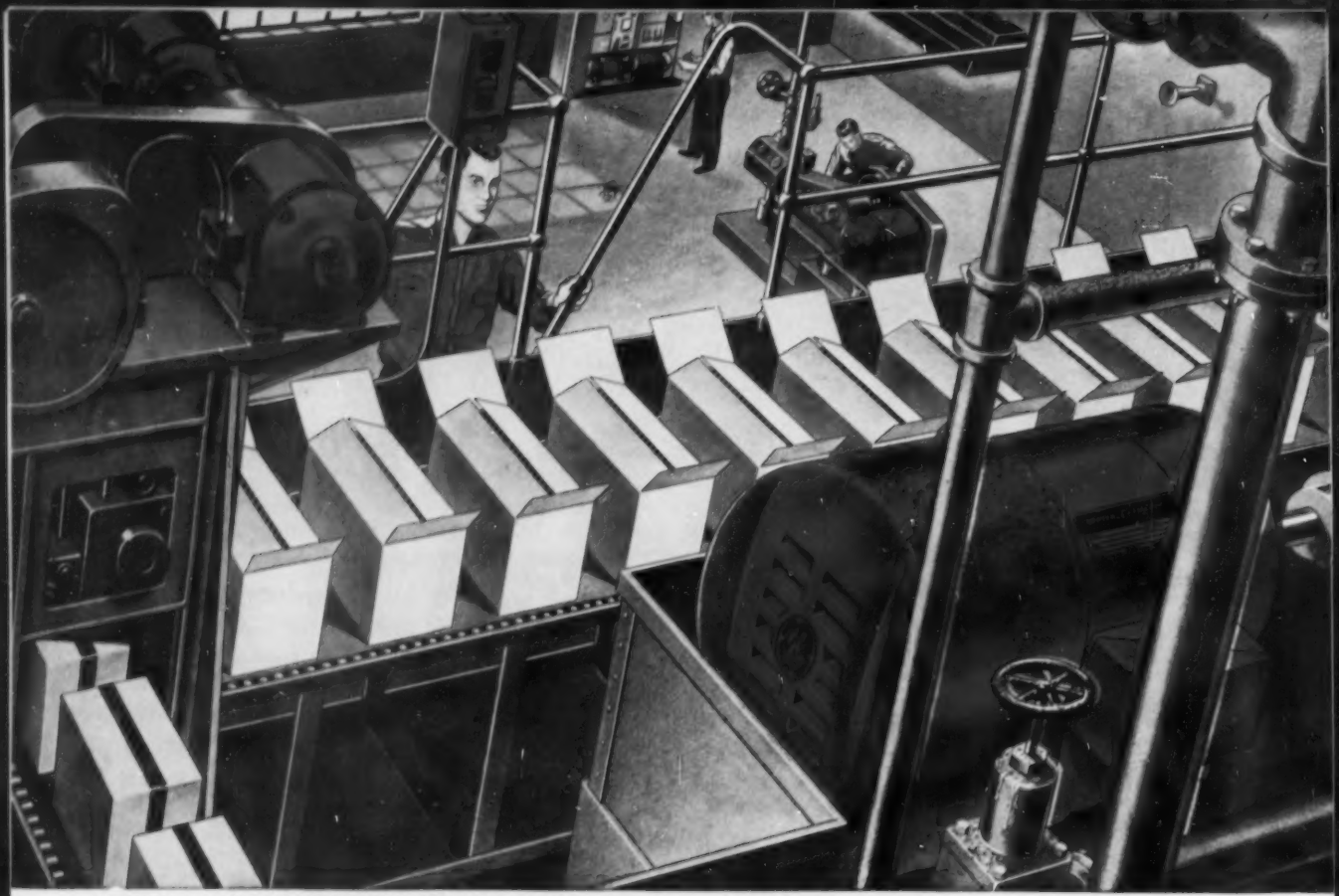
The facts are, of course, that while 80% of our homes desperately need electrical modernization only a very small fraction are going to need extensive **replacement** of the existing branch circuit wiring and outlets. Furthermore with expert modern methods and materials, the new wiring and even extensive changes in the old can be accomplished without perceptible damage to the existing decorations.

In its strict sense, "rewiring"—to wire anew—is not only misleading to the customer but its use within the industry tends to obscure the primary target at a time when the objectives and benefits of electrical modernization should be absolutely clear. To **restore** existing wiring **like new,** in every detail, may serve no important objective of electrical modernization, or necessarily provide significant benefit to the consumer.

The purpose of residential electrical modernization is to provide new high-capacity, load-matched, convenient, useful, electrical systems; **"housepower"**, so that people can **"live better electrically"** by modern standards with ready access to cheap and abundant electrical energy.

The wiring modernization job must serve this purpose if it is to provide substantial benefit and value to the user. The design and installation of such systems involve basically new work and may require little, if any, actual "rewiring".

Wm. T. Stuart



POWER . . . WHERE POWER PAYS OFF. No matter how tough or how special the conditions, Graybar-distributed G-E motors and controls give you full overload protection, guard against physical damage, electrical breakdown and operating wear.

How to cut down-time . . . step up production

FREE booklet tells how BUStribution provides for today and tomorrow

Bulldog BUStribution is today's most efficient, most modern electrical distribution system. It provides the utmost in plant layout flexibility: 1. Allows simple easy changes as machinery is moved about. 2. Will meet demands of newly installed, high production, automatic machinery. BUStribution flexibility and economy are fully explained in this illustrated booklet. Write Graybar. Request Bulletin BD-750.



Here are two practical suggestions: *the first* gives your customers maximum defense against shutdown due to motor failure; *the second* insures reliable nonstop production shift-after-shift.

1. NEW, G-E TRI/CLAD '55' MOTOR — via Graybar. This all-new G-E Motor is built to last longer, perform better. New compact dripproof, rust-resistant cast-iron construction . . . new water shedding silicone stator windings . . . new stronger polyester film insulation . . . higher full load speeds . . . longer bearing life without regreasing.

2. GRAYBAR'S SPECIAL SERVICE ANALYSIS. Do your service conditions demand totally enclosed motors? Variable speed? Gear or reversible? A Graybar Power Apparatus Specialist will work with you in selecting the exact equipment for any machine-drive requirement. Call on him. It will pay off in longer, trouble-free performance. Remember, Graybar distributes the *complete* line of G-E motors and controls.

As a matter of fact, your local Graybar Representative can provide practical application data on more than 100,000 different electrical items. For wiring projects, for instance; or lighting, ventilation and communication; complete information is as near to you as your telephone. 437-42

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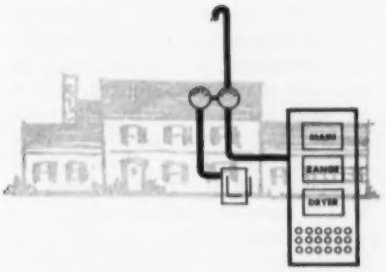
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IN OVER 130 PRINCIPAL CITIES

PRACTICAL IDEAS FOR

Residential Electrical Modernization



Sparked by unprecedented consumer promotion, home electrical modernization will be the most-talked-about business opportunity for electrical contractors in the months ahead.

THREE new giant consumer education and promotion programs will be launched this year all bearing, in substantial part, on electrical modernization of existing homes.

"ACTION", the American Council to Improve Our Neighborhoods, will include wiring modernization in its broad efforts to combat neighborhood decay.

"Live Better Electrically", a nation-wide program devoted to bringing the benefits of modern electrical living to more people, will actively promote residential electrical modernization.

"House-power", a program sponsored by the Edison Electric Institute, is directed specifically at building up the electrical capacity of existing wiring systems.

Every home owner who watches television, listens to the radio or reads newspapers and magazines, will be exposed many times to the importance and benefits of electrical modernization. The combined impact will be far beyond anything

Table 1—Capacity Check List—Owner's Copy

In order to provide adequate electrical capacity for your home it is important for the electrical contractor to anticipate your future requirements in his design calculations. Please check each item in this list carefully in the appropriate column.

	Provide capacity for			Do not provide capacity for	
	Appliances now owned	Expect to buy	Future purchase possible	No possibility of future purchase	Impractical in present home
Electric range					
Extra oven					
Electric water heater					
Clothes dryer					
Automatic clothes washer					
Dishwasher					
Disposal unit					
Refrigerator					
Freezer					
Electric ironer					
Sump pump					
Attic fan					
Room air conditioner (How Many?)					
Central air conditioner					
Bathroom heater					
Supplementary electric heat (Which rooms?)					
Complete electric heating					

ever before attempted by the electrical industry.

The follow-through and the actual task of modernizing the electrical systems of existing homes falls upon the electrical contractor who must convert promotional effort into profitable sales; profitable for him and profitable for the electrical industry which is supporting the effort.

Crucial to the success of any and all electrical modernization programs is the overriding consideration that the customer must be able to buy, with confidence, a service of distinct value to him. Yet many of the values in electrical modernization are concealed in walls, obscured by technology, or hidden away in severely plain metal boxes. Much of the value, too, in electrical modernization is intangible at the time of installation. Good design must provide for future needs as well as present requirements.

The responsibility on the electrical contractor is severe. He will receive no prepared plans and specifications. The owner's instruction will be, in most part, superficial and non-technical yet they must be rendered in sound adequate additions and modification to the electrical system which provide for present and future needs adequately.

As public demand for electrical modernization grows, electrical contractors will eventually develop "package" installations which will eliminate the need for costly individual job analysis and detailed estimates.

Installation standards are, in most part, subject to the provision of the National Electrical Code and local or state rules that apply. Design and capacity considerations are, however, subject largely to the responsibility of the electrical contractor and it is in this area where the consumer and the contractor will both profit by the development and adoption of practical standards or clearly defined "packages".

This round-up of ideas for electrical modernization has been prepared by the editors of *Electrical Construction and Maintenance* to provide some practical guide lines into the scope and the challenging opportunities of this great, awakening market. The material pertaining to system design and capacity will be found to be substantially in accord with the National Electrical

Table 2—Typical Service Requirements

A. Minimum modernization; lighting, small appliance, laundry and minimum air conditioning; no electric cooking or water heating. (Note 1)

Lighting 1,500 sq ft at 4 watts		6,000 watts	(Note 2)
Small appliances		4,000 watts	(Note 3)
		10,000 watts	
3,000 watts at 100% demand		3,000 watts	3,000 watts
Remainder at 35% demand		7,000 watts	2,450 watts (Note 4)
Electric range—none			
Fixed appliances—			
Washing machine	1,200 watts		
Dishwasher	1,200 watts		
Dryer	5,000 watts		
Air conditioner, 2-¾T	2,400 watts		
Total at 75% demand	9,800 watts		7,350 watts
Water heating—none			
Space heating—none			
		Demand total	12,800 watts

Service conductors 53 amps at 240 volts
Minimum conductor size No. 6R

Power center circuits

Main	60-amp 2p
Dryer	30-amp 2p
4 Fixed appliances	20-amp 1p
2 Appliances	20-amp 1p
2 Isolating (Note 5)	20-amp 1p
4 General purpose	15/20-amp 1p
2 Spares	20-amp 1p

B. Typical "100-amp" modernization; lighting, small appliances cooking, laundry, water heating and minimum air conditioning.

Lighting 1,500 sq ft at 4 watts		6,000 watts	(Note 2)
Small appliances		4,000 watts	(Note 3)
		10,000 watts	
3,000 watts at 100% demand		3,000 watts	3,000 watts
Remainder at 35% demand		7,000 watts	2,450 watts (Note 4)
Electric range			8,000 watts
Fixed appliances—			
Washing machine	1,200 watts		
Dishwasher	1,200 watts		
Dryer	5,000 watts		
Air conditioner, 2-¾T	2,400 watts		
Total at 75% demand	9,800 watts		7,350 watts
Water heating			2,500 watts
Space heating—none			
		Demand total	23,300 watts

Service conductors 97 amps at 240 volts
Minimum conductor size No. 1 R
No. 3 RH

Power center circuits

Main	60-amp 2p
Range	60-amp 2p
Dryer	30-amp 2p
Water heater	20-amp 2p
4 Fixed appliances	20-amp 1p
2 Appliances	20-amp 1p
2 Isolating (Note 5)	20-amp 1p
4 General purpose	15/20-amp 1p
2 Spares	20-amp 1p

C. Modernization for individual room air conditioning; lighting, small appliances, cooking, laundry, water heating and unit air conditioning in each principal room.

Lighting 1,500 sq ft at 4 watts		6,000 watts	(Note 2)
Small appliances		4,000 watts	(Note 3)
		10,000 watts	
3,000 watts at 100% demand		3,000 watts	3,000 watts
Remainder at 35% demand		7,000 watts	2,450 watts (Note 4)
Electric range			8,000 watts
Fixed appliances—			
Washing machine	1,200 watts		
Dishwasher	1,200 watts		
Dryer	5,000 watts		
Air conditioner, 1½T	2,400 watts		
2-¾T	2,400 watts		
2-½T	2,000 watts		
Total at 75% demand	14,200 watts		10,650 watts
Water heating			3,000 watts
Space heating—none			
		Demand total	27,100 watts

Service conductors 110-amp at 240 volts
Minimum conductor size No. 1 R
No. 2 RH

Power center circuits

Main	60-amp 2p
Range	60-amp 2p
Dryer	30-amp 2p
Water heater	20-amp 2p
8 Fixed appliances	20-amp 1p
2 Appliances	20-amp 1p
2 Isolating (Note 5)	20-amp 1p
4 General purpose	15/20-amp 1p
2 Spares	20-amp 1p

D. Modernization for central air conditioning; lighting, small appliances, cooking, laundry, water heating and central air conditioning. (Note 6)

Lighting 1,500 sq ft at 4 watts		6,000 watts	
Small appliances		4,000 watts	
		10,000 watts	
3,000 watts at 100% demand		3,000 watts	3,000 watts
Remainder at 35% demand		7,000 watts	2,450 watts
Electric range			8,000 watts
Fixed appliances—			
Washing machine	1,200 watts		
Dishwasher	1,200 watts		
Dryer	5,000 watts		
Total at 100% demand	7,400 watts		7,400 watts
Central air conditioner			5,000 watts
Water heating			2,500 watts
Space heating—none			
		Demand total	28,350 watts

Service conductors 118-amps 240 volts
Minimum conductor size No. 0 R
No. 1 RH

Power center circuits

Main	60-amp 2p
Range	60-amp 2p
Dryer	30-amp 2p
Water heater	20-amp 2p
Air conditioner	60-amp 2p
2 Fixed appliances	20-amp 1p
2 Appliances	20-amp 1p
2 Isolating (Note 5)	20-amp 1p
4 General purpose	15/20-amp 1p
2 Spares	20-amp 1p

E. All-electric modernization; lighting, small appliances, cooking, laundry, water heating, central air conditioning and electric space heating. (Note 7)

Lighting 1,500 sq ft at 4 watts		6,000 watts	
Small appliances		4,000 watts	
		10,000 watts	
3,000 watts at 100% demand		3,000 watts	3,000 watts
Remainder at 35% demand		7,000 watts	2,450 watts
Electric range			8,000 watts
Fixed appliances—			
Washing machine	1,200 watts		
Dish washer	1,200 watts		
Dryer	5,000 watts		
Total at 100% demand	7,400 watts		7,400 watts
Central air conditioner	5,000 watts		
Water heating			2,500 watts
Space heating			15,000 watts
		Demand total	38,350 watts

Service conductors 160-amp at 240 volts
Minimum conductor size No. 000 R
No. 00 RH

Power center circuits

Heating main	70-amp 2p
Main	60-amp 2p
Range	60-amp 2p
Dryer	30-amp 2p
Water heater	20-amp 2p
Air conditioner	60-amp 2p
2 Fixed appliances	20-amp 1p
2 Appliances	20-amp 1p
2 Isolating	20-amp 1p
4 General purpose	15/20-amp 1p
2 Spares	20-amp 1p
6 Heating	20-amp 2p

Note 1. If electric cooking and water heating are clearly improbable.
Note 2. Minimum code requirement is 3 watts per sq ft.
Note 3. Minimum code requirement is 1,500 watts.
Note 4. If minimum code calculation is used, this value is reduced to 1,000 watts.
Note 5. For refrigerator-freezer and heating plant isolating circuits if installed.
Note 6. Will also provide for up to 5 kw of supplementary space heating.
Note 7. Also for unit air conditioning with appropriate panel modifications.

Code and the recommendations of the all-industry sponsored Residential Wiring Handbook. Somewhat higher values than the Code method has been used for that part of the service entrance capacity applying to lighting and small appliances. The Code values are given as a footnote, however, if the minimum value is desired.

The residential modernization project may consist of several of the following seven steps:

1—Install new high capacity service conductors and power distribution center.

2—Provide new special purpose appliance outlets and circuits for heavy-duty and automatic appliances.

3—Provide additional new plug receptacle outlets, switches and lighting outlets as required.

4—Split existing circuits and reconnect to new power distribution center.

5—Inspect and repair or replace defective or obsolete parts of existing wiring system.

6—Replace existing lighting fixtures and install new lighting as required.

7—Replace existing signal equipment and add new devices as required.

Service Entrance

The residential service entrance conductors must be capable of carrying safely the total system load. The accepted method for calculating the minimum size of service entrance conductors is given in Article 220 of the National Electrical Code. The typical examples presented here follow this method of calculation.

It is apparent from the method that *future* probable loads *must* be anticipated if the service conductors are to serve safely the needs of new appliances as they are acquired and connected.

One method of appraising future probable loads is to employ a check list similar to the one illustrated in Table 1. By going over this in detail with the customer, or asking him to fill it out, the contractor will find this a valuable suggestion list and sales tool. Because it requires definite decisions on each item both the customer and contractor have a clear picture of exactly what loads are to be provided for.

If a detailed appraisal is impractical, the following approximations will usually provide service en-

Table 3—Load-Matched Wiring

Appliance	Typical wattage	Circuit conductors	Voltage	Circuit protection	
Electric Range	10,800	#6	120/240	50-amp	
Oven—built-in	4,500	#10	240	30-amp	
Range top—2 Unit	3,000	#12	120/240	20-amp	
Range top—4 Unit	6,000	#10	120/240	30-amp	
Dishwasher	1,200	#12	120	20-amp	
Refrigerator-freezer	400	#12	120	20-amp	Note 1
Dryer	5,000	#10	120/240	30-amp	
Washer-dryer	5,000	#10	120/240	30-amp	
Washer	1,200	#12	120	20-amp	Note 2
Ironer	1,600	#12	120	20-amp	Note 2
Water heater	3,000	(as required by utility specifications)			
Air conditioner (room) ¾T	1,200	#12	120	20-amp	
Air conditioner (room) 1½T	2,400	#12	240	20-amp	
Central air conditioner	5,000	(as required by manufacturer's specifications)			Note 3
Heat pump	7,500	(as required by manufacturer's specifications)			Note 4
Heating plant	300	#12	120	20-amp	Note 5
Electric space heat	15,000	(as required by system layout)			Note 6
Bathroom heater	1,500	#12	120	20-amp	

The above loads are representative of those which require individual circuits, or which are preferably served by individual circuits as explained by the following notes:

Note 1. Refrigerators and freezers may be served by outlets on an appliance circuit. It is recommended, however, that these appliances be served by a separate circuit with no other outlets. The purpose of this recommendation is to eliminate the probability of interrupting the operation of these appliances as a result of connecting faulty cords or portable appliances to the same circuit

Note 2. The automatic washer or the ironer may be served by an outlet on an appliance circuit. Separate circuits are recommended, however, because at portions of the operating cycle such equipment often takes 50% or more of the full circuit capacity.

Note 3. Central air conditioning load and circuit requirements vary with the size and capacity of the plant. Typical residential plants are rated at 3 and 5 hp in compressor load and ½ hp in fan load. Wiring should be installed in accordance with the manufacturer's specifications.

Note 4. Heat pump load and circuit requirements vary with the size and capacity of the plant. Typical residential plants are rated at 3, 5 and 7½ hp in compressor load, ½ hp in fan load plus, in some instances, supplementary resistance heating. Wiring should be installed in accordance with the manufacturer's specifications.

Note 5. Many local ordinances require a separate circuit for the oil burner or heating plant. It is also advisable for the reasons given in Note 1 above.

Note 6. Electric heating load and circuit requirements vary with the heating design requirements. Fixed electric space heaters are conventionally connected on 240-volt, No. 12 branch circuits. The connected load should not exceed 80% of circuit capacity.

trance capacity of reasonable adequacy and require only decisions on the broad general functions to be provided for.

	Watts
1—Lighting and appliances	7000
2—Laundry	6000
3—Cooking	8000
4—Water Heating	3000

Under normal single family occupancy, the above requirements are met with the 20-kw or 100-amp service which has a maximum capacity of 24,000 watts.

Requirements for air conditioning should be considered as *additional* to the above. Typical design values for future air conditioning (cooling) is 5 to 10 kw. The above functions plus provisions for air conditioning are met with the 30-kw or 150-amp service.

Over most of the U. S., load requirements for electric heat exceed those for summer cooling. Typical design values for electric heat are from 12 to 24 kw. Capacity for electric heat should be *added* to the load requirements for the conventional functions above. Since design requirements vary with climate, insulation and size of the house, no typical value will suit all requirements.

For both air conditioning and electric heat, the larger of the two loads is added to the conventional loads to determine the service requirements. For example, if the cooling load is 10 kw and the heating load 8 kw only the cooling load would have to be added to the 24 kw of conventional load.

An important exception to this practice is the installation involving a heat pump with supplementary resistance heating. For such installations the supplementary heating load must be *added* to the heat pump load to determine the size of the service conductors required.

Service Entrance Equipment

High capacity residential service entrance equipments for 100 amps and above are available as stock items from many of the leading manufacturers. Some provide for interchange of standard components to make up a large variety of potential circuit arrangements.

The service entrance equipment should be selected to serve adequately and safely all present and anticipated loads. It should provide for connection of future appliances and loads without substantial

changes in the existing circuitry and without hay-wire additions.

The examples shown in Table 2 are typical equipments for the load requirements described. They may be fusible or circuit breaker construction.

Branch Circuits

Heavy duty and special purpose branch circuit data is presented in Table 3. The requirements are essentially the same as for new construction.

For new appliance circuits to the kitchen and dining room, it is usually less costly to install new receptacles than to try to reconnect an existing outlet. In older houses, there is usually only one or two plug receptacle outlets in the kitchen. New outlets can usually be conveniently located so that they relieve the existing receptacle from probable overloading. Multi-outlet strips over kitchen counters and along the dining room baseboard are adaptable and relatively easy to install in existing homes.

Pick-up and dividing of existing circuits on new home runs is not always necessary but is an inexpensive way to increase the available capacity at existing oulets.

The number and location of new outlets will usually present no problem as owners usually know exactly what they want. Switches, on the other hand, usually have to be suggested. When multiple point switching is needed, the low-voltage remote control devices are particularly adaptable to existing homes. Another item that may have to be suggested is closet lighting with door switch control. This very useful feature almost disappeared in ordinary residential construction during the 30's and deserves a vigorous revival.

Signals & Communication

Homes wired more than 15 years ago usually have outmoded door signals. The modernization project is a good opportunity to replace obsolete signals with modern devices. The following are some signal modernization suggestions applicable to the average project.

a) Replace door pushbuttons with new pushbuttons of modern design and construction.

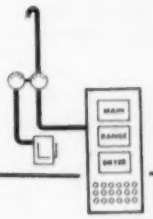
b) Replace existing bell with modern chime signal.

c) Install new extension buzzer in master bedroom.

d) Install new home fire alarm system.

e) Install new two-way intercommunication system from front door to kitchen and master bedroom.

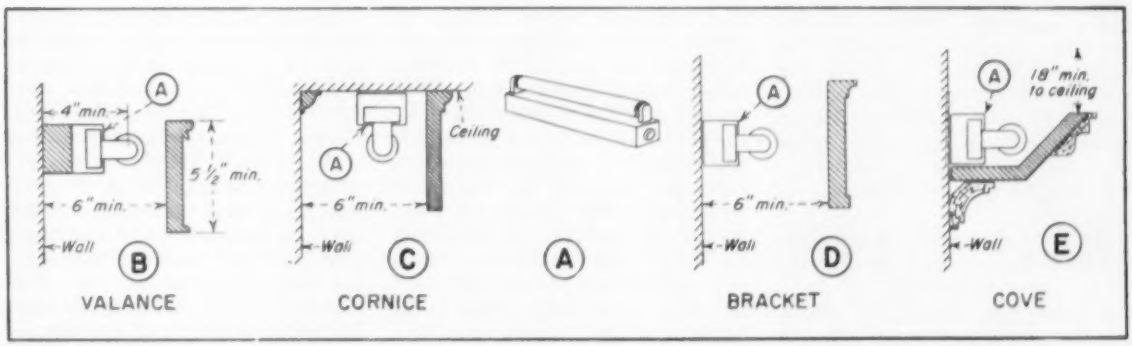
New Light for Existing Homes



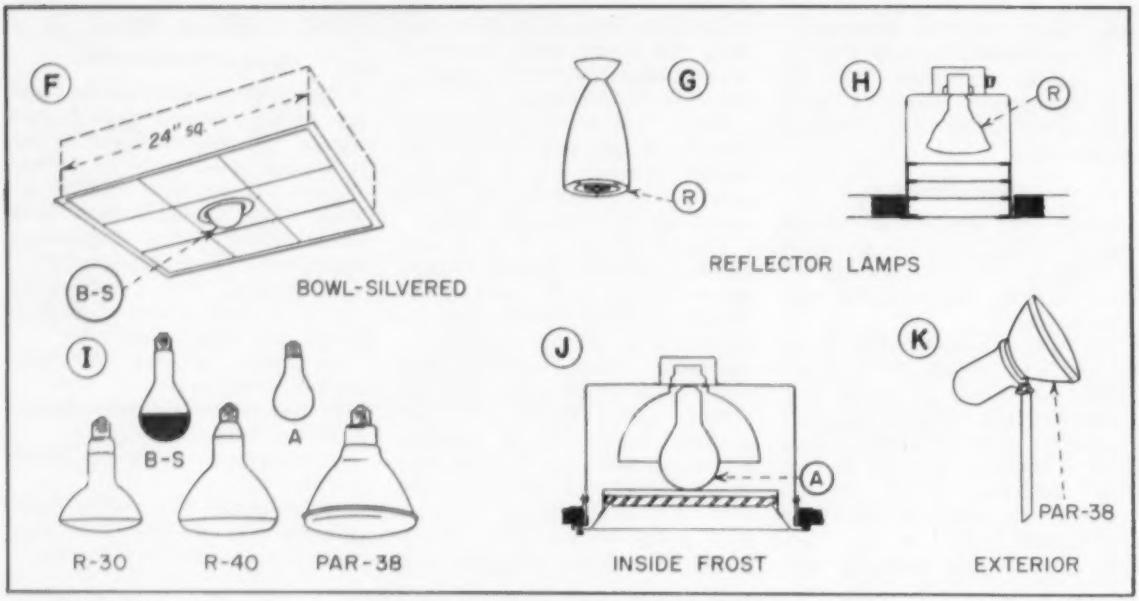
Relighting makes it possible for homeowners to bring into their existing homes many lighting benefits, such as seeing comfort, lighting convenience, and decorative beauty, and to achieve a highly modernized nighttime appearance at a reasonable cost. Its importance is pinpointed by the fact that far less than 1% of even the approximately ten million new homes built since World War II have lighting that may be considered representative of today's modern home lighting techniques, or of our technological progress and lighting knowhow. Further, all existing homes built previous to 1945 may be considered as poorly lighted, or as having lighting systems which provide little more than a bare minimum of illumination needed for necessary utilitarian uses.

An existing home may be relighted by any of a wide variety of lighting techniques, devices, and equipments. In planning the relighting, the standard of living, and the social habits and interests of the family that will live in the home will help to determine the type of lighting and degree of lighting flexibility which should be considered.

A simple solution for relighting an old home is to install center ceiling luminaires in each room or area, selected to provide appropriate lighting intensities for the general activities carried on in each room or area. In the living room, however, it will be found, for ex-



LIGHTING STRIP consisting of fluorescent lamp, wiring channel and accessories, provide key to many built-in lighting techniques —valances, cornices, brackets, coves, luminous ceilings or large area panels, under-cabinet and over-sink lighting, decorative color effects and others. Lighting strips (A) are available in various sizes for various size and length lamps.



FILAMENT LAMPS of many types and sizes lend themselves to built-in home lighting techniques, provide plenty of light for seeing, for utility lighting, and for decorative lighting effects in white or in color.

ample, that supplementary lighting is needed for many activities, and the normal practice has been to provide this lighting with floor and table lamps. In this relighting solution, the luminaires will be selected based on their decorative design treatment, and on the shielding, diffusion, and similar features which contribute to lighting and visual comfort. With this type of lighting, flexibility of effects, decorative value, and other lighting benefits will be at a minimum. Such lighting systems, while they meet the bare essentials of utilitarian demands, then fail completely to meet the expanding and growing lighting needs of the modern homeowner.

Today's typical family engages in a wide range of activities within the home. These include cooking, eating, sleeping, shaving, bathing, dressing, playing, entertaining, drinking, listening to radio and music, viewing television, conversation, relaxing, reading, writing, painting, serving, studying, dancing, showing slides, laundering, ironing, working at hobbies, and many others.

Such a wide variety of activities requires maximum lighting flexibility, and a broad range of lighting intensities, decorative effects, and functional lighting results—to create an appropriate atmosphere or environment for each activity, and for the mood and temperament of the occupants. There is no single type of lighting system, nor type of luminaires or lighting equipment, that will provide a satisfactory solution. Rather, it is desirable that many lighting techniques be used, each of which provides a specific lighting result, and that all be coordinated and integrated with maximum flexibility of switch and dimmer control so that every possible and conceivable lighting effect is available at the flip of a switch. Only with this type of planning can the full benefits and advantages of modern home lighting be realized and enjoyed as a counterpart of true contemporary electrical living.

In using light to modernize an existing home, the objective should be to provide greatly improved visibility, seeing comfort, and decorative treatment. Good lighting of proper quality and quantity for each activity should be available exactly where needed merely by operating a switch. Further, the lighting should create a bright, colorful, and cheerful environment, and serve as a part of the decorative treatment. The equipment itself should be subdued, or completely concealed. Only the lighting result, patterns of light or highlights and soft shadows, should be seen. These patterns of light, as for example a vase of flowers on a center table highlighted from a ceiling-concealed pinhole spotlight, should be integrated into the decorative treatment of the room.

A maximum of modern lighting effects can be accomplished by providing both general and local lighting with built-in, recessed, and fixed and portable types of lighting units artistically and functionally integrated with the architectural, structural and decorative elements of the house. In existing homes, structural details must be determined in connection with all built-in or recessed units considered.

Built-in and recessed or concealed lighting offers almost unlimited opportunity for individual lighting treatments throughout a home. It is necessary only to observe the principles of good lighting design practice to adapt any of the wide variety of equipments and techniques which are now available when designing an individual lighting treatment for a specific location, and for a specific distribution of light control of a specified color quality. The accompanying illustrations give only a few suggestions of the types of lighting treatments which may be considered. Progressive and imaginative architects, builders, decorators and designers, working closely with qualified lighting engineers and electrical contractors, will be able to develop and design many individual applications which conform with specific structural details and harmonize with the size and shape and with the

decorative design of the area where installed.

The basic element for special built-in and concealed lighting design is the light source, or lamp. For example, the fluorescent lamp tube and wiring channel (A in the illustration) is the key to valance, cornice, bracket and cove lighting techniques (B, C, D and E), and for many other similar techniques. Also, standard filament lamps of the inside frost, bowl-silvered, or reflector types (I) may be used in a wide variety of standard recessed or built-in types of units (F, G, H, J and K), and dozens of others to meet the broad range of requirements for different distributions of light, illumination intensities, color of light beam, etc.

In general, three types of lighting are needed in the home. First, general illumination is needed, for flooding an entire room or area with light. Second, local lighting is needed, for building up a high level of illumination over a small area, as for example at an easy chair for reading. Third, light for decoration is needed, and can be either of two types. It can be a lighted ornament, such as a self-illuminated terrestrial globe, or a patch of light of a selected color, such as an amber light beam flooding a bowl of fruit.

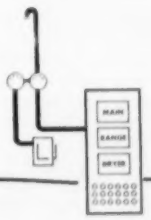
General illumination should be provided for every room—living room, dining room, bedroom, bath, kitchen, laundry, recreation room, etc. It is needed for utilitarian purposes, such as for cleaning, for circulation from one room to another, and for balancing brightness ratios of each room to provide a comfortable visual environment. The most simple solution is to install a ceiling luminaire (fixture) in the center of the ceiling, as has been general practice for many years. But general illumination may also be obtained by means of cove lighting, by valances, brackets and cornices, by large-area luminous panels, by reverse coves which wash the walls with light, by coffers or soffits, or by ceiling recessed incandescent lamp units (Types F, H, J), and other similar means. Control of this type of lighting by dimmers is highly desirable, permits the exact lighting level to be obtained for any total lighting effect in any room or area.

Local lighting should be provided in most rooms, especially for each local area where higher lighting levels are needed for quick and easy seeing, such as reading, studying, preparing food, and similar home activities. Floor and table lamps provide local lighting, and when open at the top they also provide a degree of general lighting over a limited area. Local lighting may also be provided by controlled beam light distribution units mounted on the wall or ceiling, or ceiling recessed (Types G, H, J), or by tubular units mounted under a cabinet for lighting a work table below, and other similar applications.

Local lighting for a kitchen sink can be provided by a recessed incandescent unit in the ceiling or window soffit overhead. When equipped with suitable prismatic lenses, an elongated light pattern which lights the sink and drainboard only can be provided. Large-area low brightness units can be ceiling mounted in the living room, or recreation or play area to provide local diffuse lighting on a bridge table, or for ping pong, etc.

Night lights should be wall-recessed in hallways, stairways, bath and bedrooms, and along the lane of travel throughout the house, and kept burning continuously. Relighting plans should also extend to the exterior, where entrance lights should be used for front and rear doors, and lighting should further be used to light the house number, the garage doorway and driveway, walkway to the garage from the house, exterior play areas (unit K), garden paths and pools, and trees and shrubbery for outdoor decorative purposes.

Electric Heating



Heating problems in older homes are numerous, yet nearly all of them can be satisfactorily solved electrically, because one or more electric units can augment an inadequate central heating system, can warm living quarters that have been added after a building has been initially completed, can furnish heat to local areas when it is neither feasible nor desirable to heat the entire home, or can provide advantages of zoned heating to an unzoned system.

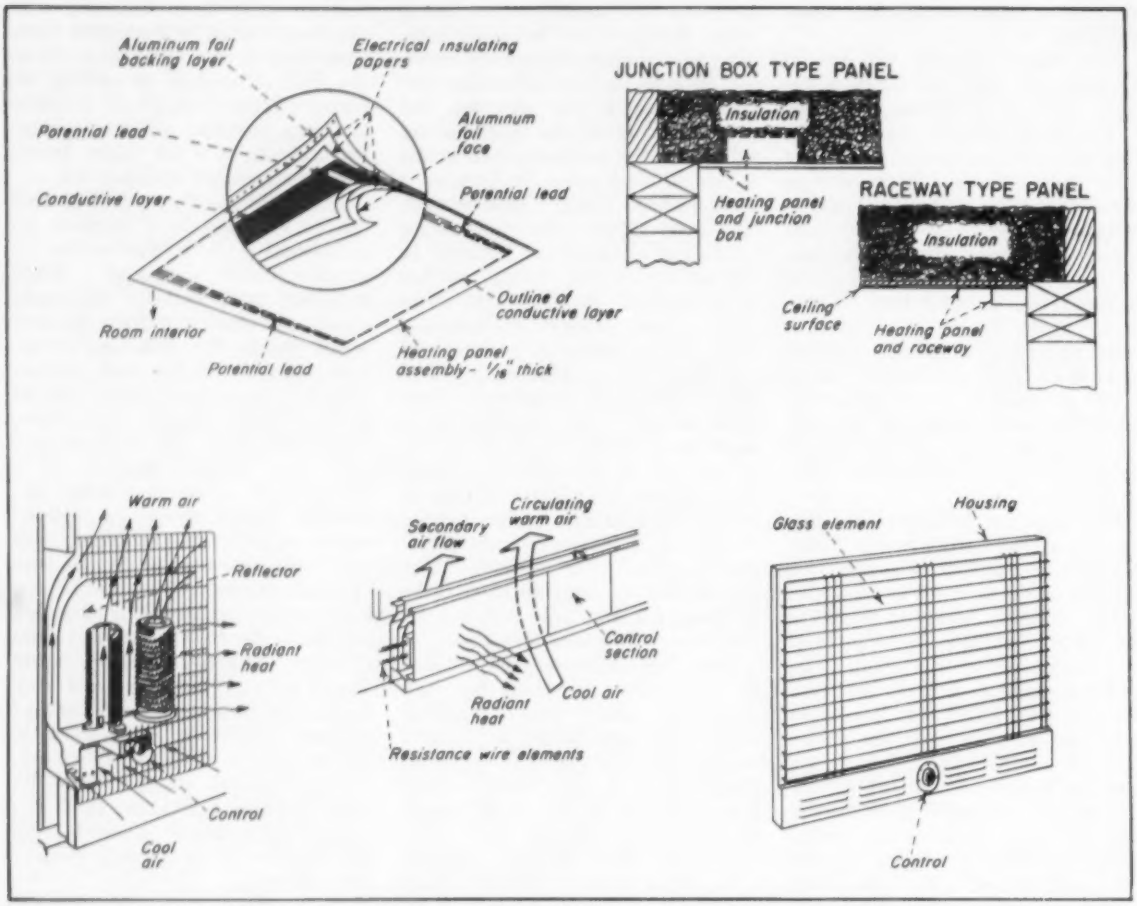
Electric heating opportunities are often provided by (1) enclosure of breezeways or open porches, (2) conversion of initially-unfinished attics into additional living quarters, (3) addition of rooms or wings to existing homes without enlarging the heating plants.

There are also numerous instances when it is desirable to provide supplementary or independent heat for nurseries, for quarters occupied by aged or infirm members of a household, for garages or workshops, or to take the chill off bathrooms or breakfast nooks on late-spring or early-fall mornings, when central heating systems are normally inoperative.

Many electric heating devices are adaptable to existing homes and provide extensive choice as to costs, heat-distribution patterns, necessary installational labor, characteristics of heat emission, surface temperatures, methods of control and recommended locations. Therefore the well-versed electrical con-



WALL HEATING units are easy to install, may be individually regulated for desired temperature, and provide fast concentration of heat for limited areas, making them applicable for heating bathrooms or similar rooms in the home.



CONDUCTIVE sheets (A) may be secured directly to ceiling by adhesive binder, with potential leads connected to circuit wiring via edge-located terminal blocks. Circuit wiring for these sheets is carried in small raceways serving also as molding (B), while rigid panels are rear-connected through factory-mounted junction boxes. Wall units (C) may augment radiation effect by convection action, natural or forced; a heating combination also obtained by electric baseboards (D) that contain resistance wires in continuous vented enclosures. Tempered glass panels (E) are also obtainable as wall or baseboard units; may be installed in existing buildings by first locating junction box, then positioning reflector back, connecting heating element leads to terminal block in box, and screwing outside cover into place.

tractor can offer home owners a wide range of options to meet specific heating requirements, personal preferences and price levels.

Contractors should assume the responsibility, however, of familiarizing themselves with the plus and minus values associated with each type of heating unit, for only then can they intelligently recommend the most effective solution to a particular problem. For example, wall panels and recessed units are easy to install, they furnish almost instantaneous heat and they furnish concentrated heat outputs for small areas. It should be remembered, however, that their surface temperatures can become relatively high, and their areas of effective heat coverage are less extensive than those related to some of the other heating means which are available to the contractor and homeowner.

Still another type of heating unit —the conductive rubber ceiling panel—has fast pick-up, provides close regulation of temperature, gives blanket coverage to floor areas, and provides even heat diffusion; yet it can be damaged by careless cutting or nailing, and it is somewhat higher in cost than some other less-efficient mediums.

Heating Patterns

In connection with these electrically-conductive ceiling panels, or sheets, it is general practice to place them in a fairly uniform pattern in order to obtain even heat distribution yet, at the same time, locate them as near as possible to exposed walls in order to counteract normal cold-air infiltration. Sheets can be applied directly to plaster, plaster board or to any other smooth surface with an adhesive binder and, since each sheet comes equipped with two terminal blocks attached to one edge, sheets may be easily wired in parallel for either 115- or 230-volt operation, using No. 12 TW wire and using small-dimensioned metal raceways to enclose both terminals and wiring and, simultaneously, to serve as a neat molding strip around the ceiling area proper.

Regardless of the heating means selected, however, separate circuits and thermostatic controls are recommended for each heating application, thereby limiting individual circuit loadings to 20 amps or less while providing the home owner with maximum comfort, flexibility, convenience and efficiency.

High Capacity

BUS RISERS FEED APARTMENT BUILDING

. . . provide service adequacy to 448 apartments in new X-shaped, 15-story structure. Electrical installation by Hydon-Brand Electric Company, Detroit.

THREE 1,600-amp, low-reactance bus duct risers feature the electrical system designed for One River House Cooperative, a new 15-story apartment project in Detroit. Extending up through electrical closets in the service core of the X-shaped building, each bus duct carries 120/208-volt, 3-phase, 4-wire power to five floors. Plenty of amps, plus a reasonable degree of spare capacity, for convenient electrical living are available at each floor. This includes electric ranges and special outlets for room air conditioners in each of the 448 apartments.

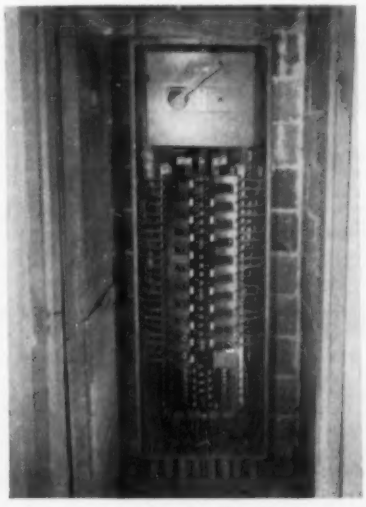
The reinforced concrete, masonry constructed, building has four wings connected to a central core housing elevators, stairways, incinerator chute, electrical and telephone closets. The ground floor includes service areas, public areas, plus certain commercial and/or professional spaces. Fourteen residential floors extend above the ground floor. A pipe space under the roof and a penthouse over the central area, containing elevator equipment and other mechanical and electrical equipment, is included in the building design. A two-story garage attached to the building has an enclosed floor slightly below grade and an open deck above. Service pits in the enclosed area contain explosion-proof electrical facilities.

Primary service begins at a utility manhole at the property line. From this point two 3-conductor, 450MCM, VC, lead-sheathed, steel-taped, 7,500-volt primary parkway cables with overall impregnated jute covering run underground to the building transformer vault and terminate in a manually-operated transfer switch interlocked with the main oil circuit breaker. Where the dual primary cables pass under roadways and into the building they are enclosed in 4-in. galvanized conduit sleeves. Half-section clay tiles protect the cables in the trench.

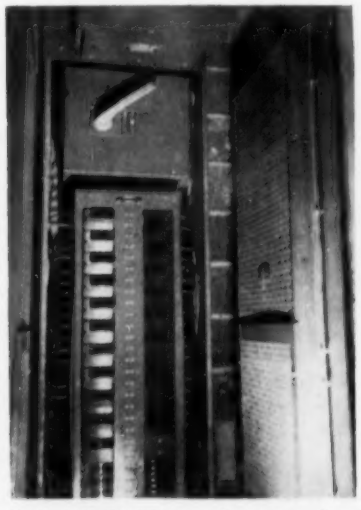
Two banks of transformers serve the electrical needs of the building. One group consists of three 500-kva,



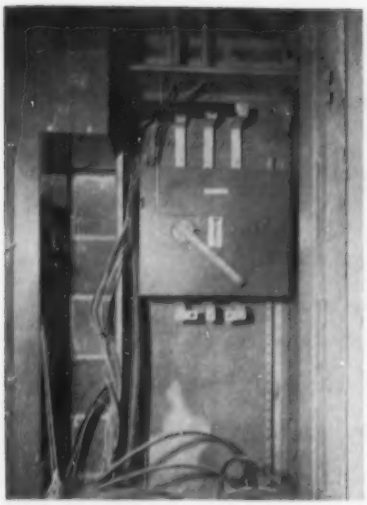
PORTION OF TRANSFORMER vault on ground floor showing two of the three 500-kva, 4800/120-volt single-phase units in three-phase bank to provide the 3-phase, 4-wire, 120/208-volt system for lighting. On opposite side are three 75-kva units to provide 240-volt power.



TYPICAL FLOOR DISTRIBUTION panel in electric closet with enclosed tap-off to bus duct riser. Panel has main 400-amp. fused switch; 22 90-amp. 2-pole 208-volt breakers for apartment subfeeders and 6 to 10 single-pole, 15-amp. breakers for corridor lighting.



TWO BUS DUCT risers blanket walls of an electric closet. Through-duct on left feeds floors above. Floor distribution panel in center is tapped off duct at right. Each duct riser serves five floors. Four sets of 4-500MCM RH-RW conductors feed each riser.



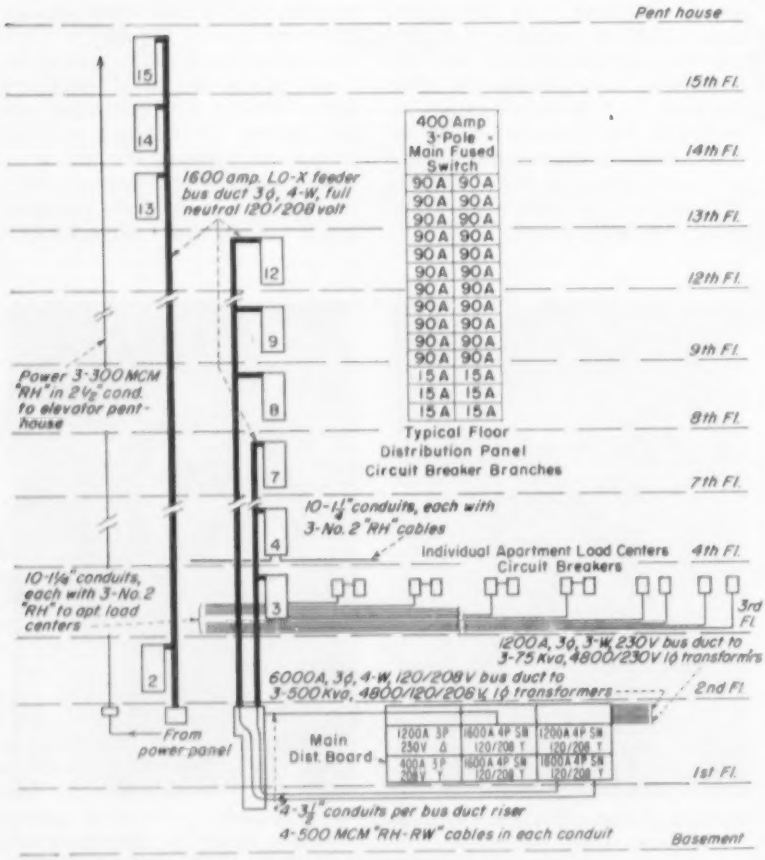
CLOSEUP OF floor tap-off to bus duct riser. Insulated copper bars tie 400-amp. main fused switch to duct bus. Neutral conductor goes to bottom of panel to which circuit breaker assembly must be added. Note confined quarters of electric closet.



WIDE FLOOR FLANGE on 1,600-amp. bus duct riser rests on concrete floor slab, helps support weight of heavy duct assembly.



FLUSH LOAD CENTER in each apartment contains 2-pole circuit breakers for range and air conditioner circuits; single-pole units for lighting and appliance circuits. Unit is located in kitchen or dinette area.



Riser Diagram-Lighting System

BUS DUCT RISERS, each 1,600-amp capacity, carry adequate electrical service to 448 tenants in new Detroit apartment building. Each duct serves five floors. Subfeeders to apartments originate at distribution panel on each floor.

single-phase, 4800/120-volt transformers connected in a 3-phase, delta-wye, bank to provide 120/208-volt power for general use. The other group consists of three 75-kva, 4800/120/240-volt, single-phase transformers connected delta-delta to provide 240 volts for power. A short section of 6,000-amp, 3-phase, 4-wire bus duct connects the 500-kva transformer bank to the lighting section of the secondary switchboard. A similar section of 1,200-amp, 3-phase, 3-wire duct connects the power bank to the power section of the board.

Secondary Feeder System

Secondary feeders originate at the secondary switchboard whose lighting section consists of three 1,600-amp and one 1,200-amp, 4-pole, solid neutral, dead-front, high-pressure contact service entrance switches equipped with high-capacity fuses. The main power section consists of one 1,200-amp, dead front, 3-pole, high-pressure contact switch with high-capacity fuses.

All first floor facilities are served by a series of distribution panels connected to the main secondary switchboard. All floors above the first are served by the bus duct risers.

Two prime factors led to a choice of bus duct for the main risers. First, the electrical closets provided an exceptionally limited space for conduits, pull boxes and floor

distribution panels. Second, it is much easier to tap-off bus duct than paralleled cables in junction boxes. Original plans called for installation of five-floor sections of bus duct with conduit and cable submains going back to the main switchboard. Each duct section would run only between the five floors which it served and terminate in a junction box where submain cables would be connected. Field studies indicated it would be almost as economical to extend each riser duct up from the basement. This would leave more working space in the electric closets, make a better job and be easier to install. On the basis of this investigation, full riser ducts were installed as shown in the accompanying riser diagram. Structural conditions, however, dictated retention of conduit and cable submains from the duct terminals at the first floor ceiling back to the switchboard.

Each riser is fed by four 3½-in. conduits, each conduit containing four 500MCM type RH-RW conductors. These originate at the 1,600-amp switch in the main board and terminate in a pull-box attached to the base of the duct run. The 3-phase, 4-wire, low-reactance bus duct has a full 1,600-ampere neutral; has a floor seal and an 1½-in. floor flange where it passes through each floor; is mounted to closet walls with ½-in. steel bolts and 1-in. pipe spacers. A steel flange welded to the base of each duct run provides additional mounting facilities for the feeder pull boxes and insures ground continuity with the conduit submains.

Floor Distribution

Focal point of the 120/208-volt, 3-phase, 4-wire, secondary distribution at each floor is the electric closet enclosing the bus duct riser, main disconnect and distribution panel. Enclosed ceiling tap-offs of either cable or insulated bus bar connect the riser to a 400-amp, 3-pole, fused, swing-out type main disconnect switch. The neutral conductor is carried on down to the floor distribution panel. A typical floor distribution panel contains 22 90-amp, 2-pole, 250-volt circuit breakers for individual apartment feeders and six 15-amp, single pole, 120-volt breakers on a separate split-bus for corridor lighting and other miscellaneous use. Panels are flush-mounted on the closet wall between bus duct risers; have a gutter trim but no door.



Center Section – Typical Floor

SERVICE CORE of typical floor has two electric closets housing duct risers and distribution panels. Each 1¼-in. feeder (3-No. 2 RH conductors) serves two small apartments at base of four building wings.

A total of 20 submains originate at each floor distribution panel and feed the apartments on that floor. Each consists of three No. 2 RH conductors in 1¼-in. conduit. In general, one feeder serves two smaller apartments at the base and in the center of each wing. Larger apartments at the end of each wing have individual feeders of the same size.

Flush type circuit-breaker load centers are conveniently located in the kitchen or dinette area of each apartment. In general, each contains one 50-amp, 2-pole breaker with tie handle for the range circuit; one 15-amp, 2-pole breaker with tie handle for the window air conditioner; one 20-amp single-pole breaker for the appliance circuit; and three 15-amp single-pole breakers for apartment lighting and convenience outlets. The larger apartment units have more branch circuits.

The 208-volt air conditioning outlet in the living room of each apartment is completely wired and ready for installation of a ¾-ton window unit. TV outlets are installed in each apartment with the coaxial cables in the telephone conduit system.

Collaborating in the design of the building were Mayer I. Blum & Sons, engineers and designers; Alfred Polingher, architect; Sweet & Schwartz, architects—all of Philadelphia, Pa.; Jules Dorfman and David Bloom, structural engineers, Philadelphia; Joseph E. Wassell, associate architect, Detroit, Mich.; Office of Herbert B. Beidler, Chicago, mechanical and electrical engineers. Turner Construction Company were the general contractors and Hydon-Brand Electric Company, Detroit, the electrical contractors.

General consensus of the designers, engineers and contractors is that tenants of One River House Cooperative need not worry about electrical adequacy. The capacity they need for present and future is where it should be—in the bus duct risers at each floor.

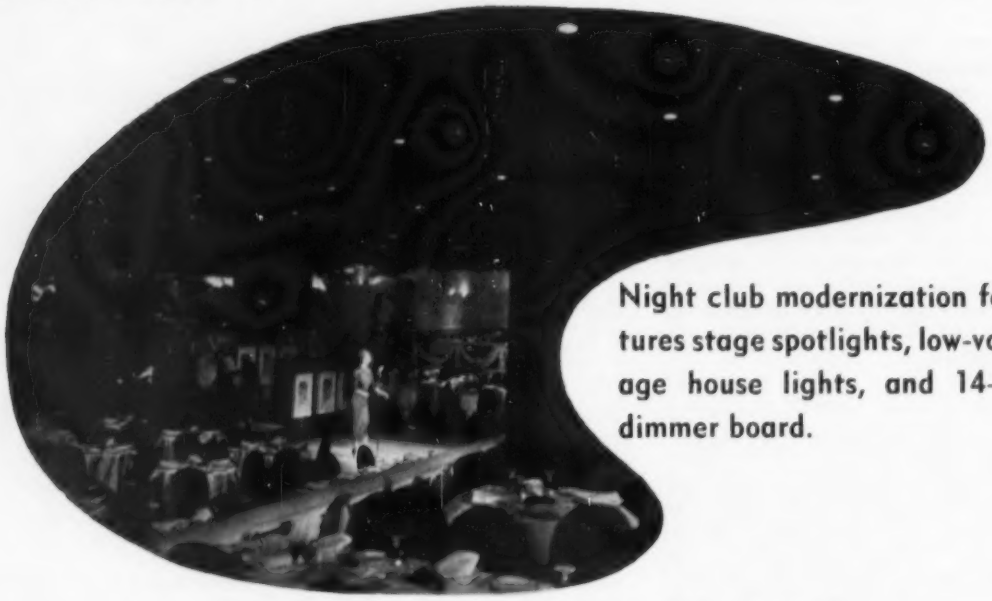
New Lighting for New York's

COPACABANA

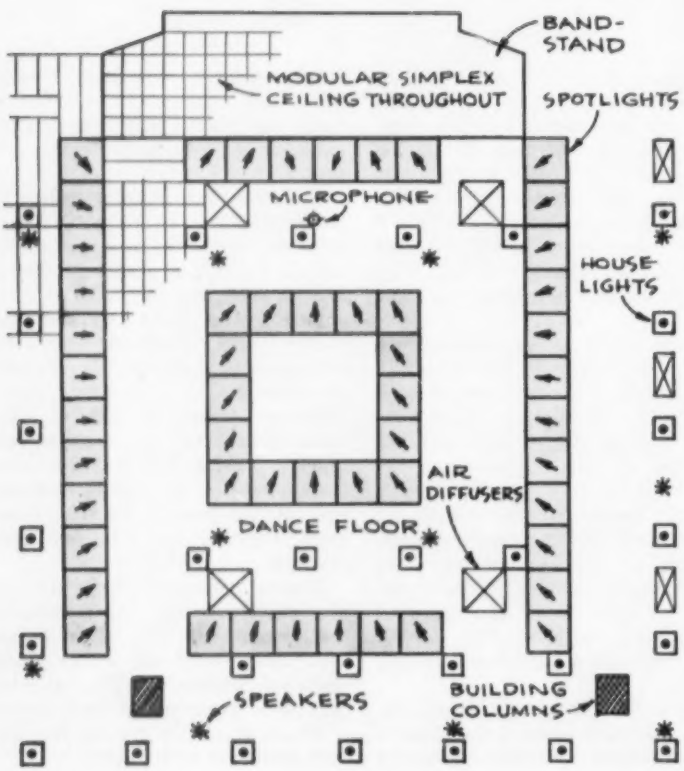
Lawrence Mitchell, *designer*

Rollo Williams, *lighting consultant*

MacNutt Electric Co., *contractor*



Night club modernization features stage spotlights, low-voltage house lights, and 14-kw dimmer board.



DANCE FLOOR IS ILLUMINATED BY 52 RECESSED LEKOLITES IN 2 CONCENTRIC SQUARES. ARROWS INDICATE BEAM DIRECTION.

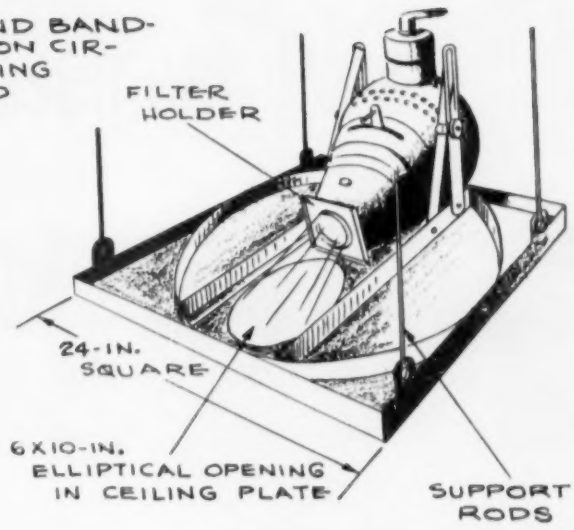
COLORED FILTERS AND MASKED APERTURES MAKE WIDE VARIETY OF EFFECTS POSSIBLE THROUGH CROSS-CONNECTING PANEL OF DIMMER BOARD.

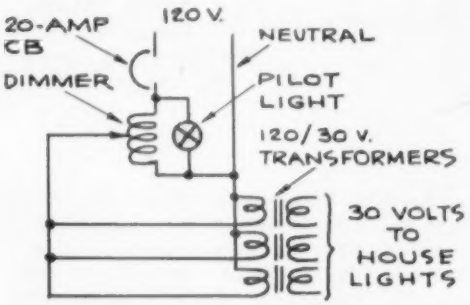
151 RECESSED PROJECT-O-LITES ON 5-FT CENTERS CONTAIN 20-WATT, 30-VOLT, AIRPLANE-TYPE LAMPS (R-12) WITH BAYONET BASE, PROVIDING GENERAL HOUSE LIGHTING.

ALL FIXTURES, INCLUDING SOUND SYSTEM SPEAKERS AND AIR CONDITIONING DIFFUSERS, ARE DESIGNED TO FIT INTO MODULAR PATTERN OF OVERALL SIMPLEX CEILING.

DARK BLUE CEILING AND SMALL-APERTURE HOUSE LIGHTS COMBINE WITH WHITE WALLS AND PALE YELLOW WAINSCOTING TO ENHANCE EFFECT OF SPACIOUSNESS AND MINIMIZE CLOSED-IN FEELING OCCASIONED BY LOW CEILING.

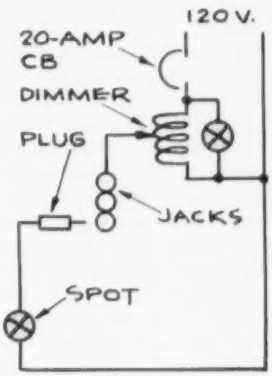
SPOTLIGHTS FOR DANCE FLOOR AND BANDSTAND LIGHTING ARE MOUNTED ON CIRCULAR TRACK ON 2-FT-SQUARE CEILING PANEL. FIXTURE MAY BE ROTATED FROM BELOW THROUGH FULL 360°; ANGLE OF TILT MAY BE VARIED BETWEEN 30° AND 75° FROM HORIZONTAL. ALL FIXTURES CONTAIN 500-WATT PROJECTOR LAMPS. ENTIRE ASSEMBLY IS SUPPORTED FROM ANGLES ON CEILING SLAB BY 1/4-IN. RODS.





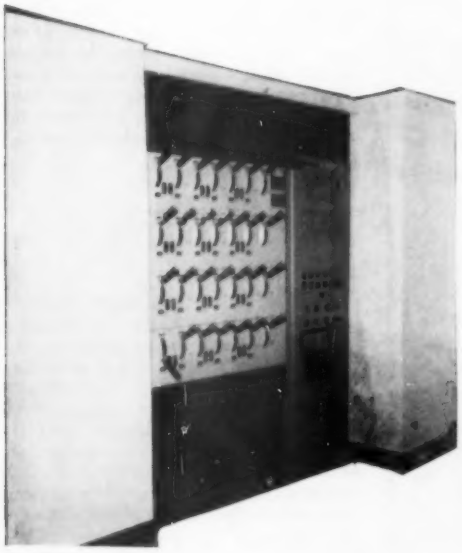
HOUSE LIGHT DIMMER CIRCUITS (ABOVE) FEED TRANSFORMERS FOR LOW-VOLTAGE R-12 LAMPS. 151 LAMPS ARE CONNECTED TO 14 TRANSFORMERS TO PROVIDE AREA CONTROL BY OPERATION OF FOUR DIMMERS; OR ENTIRE CEILING MAY BE DIMMED SIMULTANEOUSLY BY MASTER LEVER.

TRANSFORMERS ARE MOUNTED IN CABINET NEAR DIMMER BOARD.



STAGE DIMMER CIRCUITS (LEFT) USE JACK AND PLUG CONNECTIONS TO SPOTS. EACH SPOT TERMINATES IN A PLUG; 3 SPOTS MAY BE PLUGGED INTO EACH DIMMER.

ALL 52 SPOTS MAY BE PLUGGED IN AND OPERATED SIMULTANEOUSLY BY MEANS OF THE FOUR MASTER CONTROL LEVERS.



DIMMER BOARD (LEFT) OVERLOOKS DANCE FLOOR. TOP THREE ROWS OF DIMMERS PLUS FIRST TWO DIMMERS OF BOTTOM ROW CONTROL SPOTS; REMAINDER OF BOTTOM ROW CONTROLS HOUSE LIGHTS.

EXTREME RIGHT-HAND LEVER OF EACH ROW IS MASTER LEVER WHICH MAY BE USED TO OPERATE ANY DESIRED NUMBER OF DIMMERS IN THE ROW.

SOUND SYSTEM PANEL AT RIGHT OF DIMMER BOARD FEEDS 34 HIGH-FIDELITY SPEAKERS ABOVE ACOUSTIC CEILING. PROGRESSIVE REDUCTION OF SOUND LEVEL AWAY FROM MICROPHONE PRESERVES ILLUSION OF ORIGIN OF SOUND.

ENTIRE AMPLIFICATION SYSTEM IS DUPLICATED, PERMITTING QUICK CHANGEOVER TO STANDBY IN CASE OF FAILURE OF REGULAR SYSTEM.

RECORDED MUSIC IS PROVIDED BETWEEN SHOWS AND DURING INTERMISSION.



Pole-Line

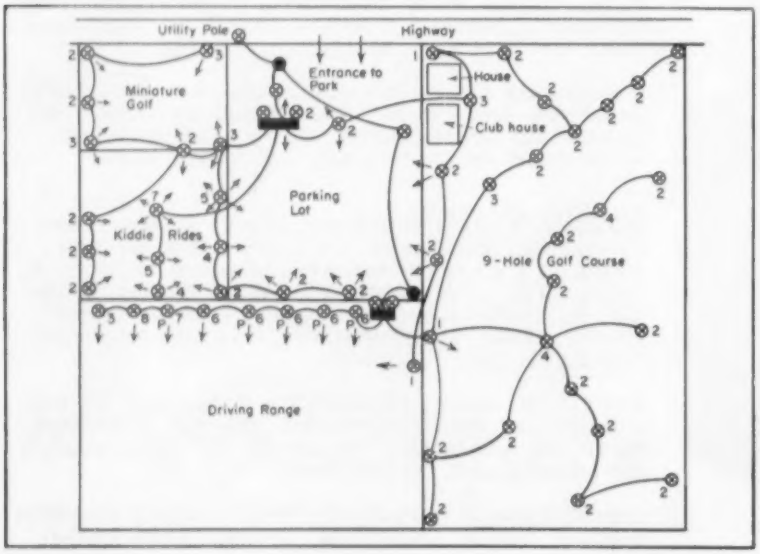
By J. Frank Myers,
Superintendent
Wetherbee Electric Company
Oklahoma City, Okla.

AN OUTDOOR electrical distribution system was recently installed as part of general modernization of Wedgewood Park, a recreation center on the outskirts of Oklahoma City. This outdoor system combines new and old electrical equipment in a modernized layout to serve the expanded facilities of the park. Because the problems encountered on this job had to be licked on the job, and within a limited budget, the successful accomplishment of all design objectives makes this an unusual modernization job.

Prior to modernization, the park consisted of a "pitch-and-putt" 9-hole golf course, a driving range, a miniature golf course and a small parking lot. And electrical facilities for these sections consisted of an inadequate layout of pole-mounted floodlights for night playing. To meet public demand for a larger park, modernization consisted of: relocating the driving range; enlarging the parking lot; and building a "Kiddie-Land" amusement park of a ferris wheel, merry-go-round, train ride, roller coaster and other similar rides. To handle the increased electrical load of motors for the kiddie-rides and a greatly improved lighting system throughout the park, a whole new electrical design was made. The new electrical design of the park incorporated much of the old equipment. A number of existing poles and floodlight units were used, but a greater number of new poles had to be set and many more floodlight units were installed.

Proper, effective lighting of the 9-hole golf course was achieved only after considerable adjusting of floodlights and addition of some more poles for additional floodlights as the job progressed. It was a step-by-step, trial and error procedure to get even lighting intensities on all of the course. The hill-and-valley terrain of the course caused highlighted spots and many shadows. Only by adjusting and readjusting the play of the floodlights could the light be distributed in such a way as to eliminate shadows behind bunkers and bright spots on sand traps and to get as much light as possible on the greens.

Accompanying photos and illustrations point up details of this job. Captions explain the work.



OVERALL PLAN of Wedgewood Park shows location of various sections of the park, pole locations, routing of circuits, number of floodlights on each pole and directions in which floodlights play. Electric power comes into the park from the utility pole at the edge of the highway.

● – Transformer Pole

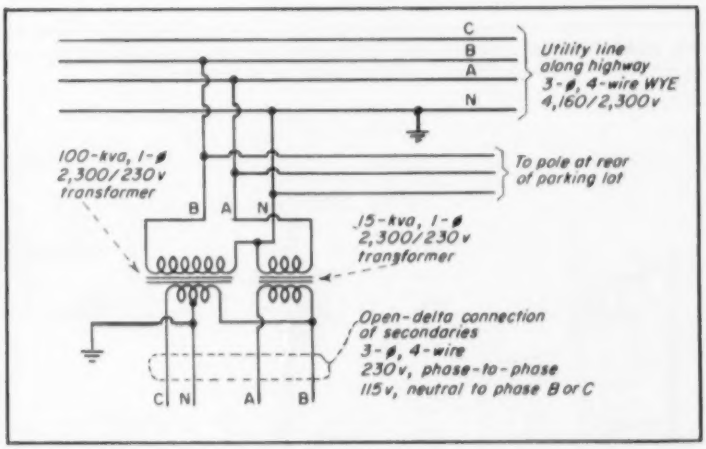
⊗ – Pole
(Number indicates number of floodlights; arrows indicate direction of light throw)

P – Projector Lamp Beacons

Wiring in an Amusement Park

Design and installation details of the pole-line distribution system powering kiddie-rides, floodlights for miniature golf and a driving range and lighting of a small 9-hole golf course at Wedgewood Park, Oklahoma City, Okla.



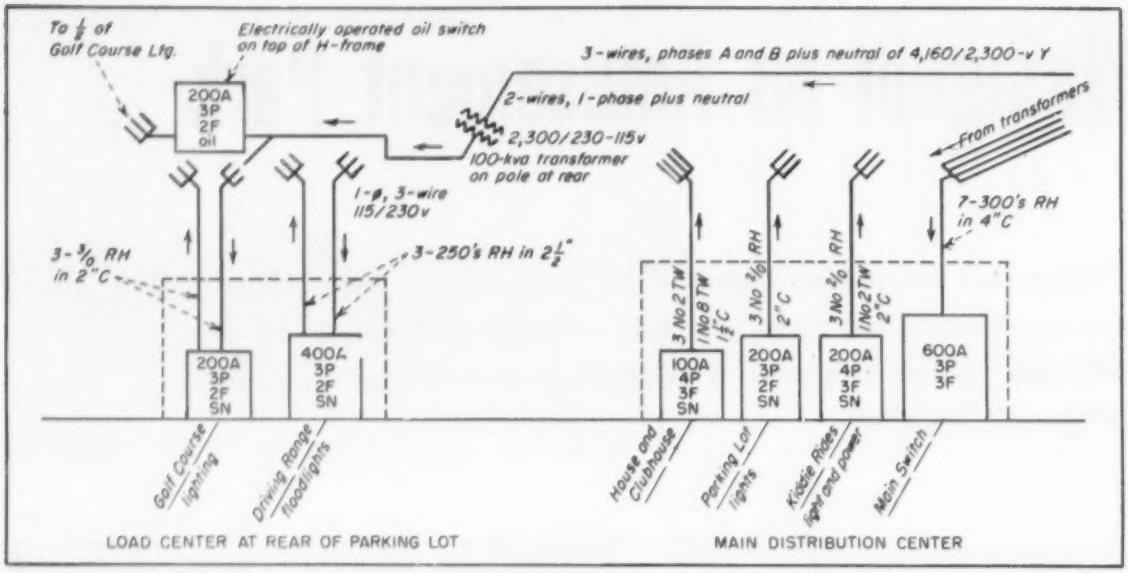


SERVICE ARRANGEMENT consists of two, pole-mounted single-phase transformers (foreground) fed from a utility pole-line along the highway (background). Two phases and the neutral of a 3-phase, 4-wire, wye-connected 4160/2300-volt line are brought in to the transformers. From the secondary side of the transformer hookup (diagram at right), the four service conductors can be seen running out of the left side of the picture to a nearby "H"-frame. The two high-voltage phases and neutral which are brought to this pole from the utility pole are carried from this pole to another pole at the rear of the parking lot.





DISTRIBUTION CENTER is fed by the open-delta, 3-phase, 4-wire, 230/115-volt, pole-mounted transformer hookup to the top of the "H"-frame (photo at left). The photo at right shows the "H"-frame from another angle, with the distribution enclosure mounted close to the ground and between the poles of the frame. In this photo the supply conductors from the pole transformers come into the picture from the right, then down in conduit to the enclosure.



TWO LOAD CENTERS, one the main distribution center and the other a load center at the rear of the parking lot, are shown in this schematic of the distribution method used at Wedgewood Park.



SECOND TRANSFORMER POLE (right) has a 100-kva, single-phase, 2300/230-115-volt transformer mounted on it. Although 2 phases and the neutral of the utility 4160/2300-volt wye system is carried back to this pole, only one phase and the neutral is used to supply the transformer. The 3-wire, 115/230-volt transformer secondary is connected to the top of the "H"-frame, at left, by the three heavy conductors running over to the frame. These conductors are tapped to a 200-amp switch and a 400-amp switch, both in the cabinet at the base of the frame, and to a 200-amp oil switch on top of the frame. The 200-amp switch in the cabinet controls flood-lighting for that half of the golf course furthest away from the clubhouse. The oil switch controls lighting for the front half of the course, adjoining the clubhouse. This oil switch is electrically operated, controlled from a toggle switch in the clubhouse. With this arrangement, lighting on the front part of the course can be turned off at the clubhouse.



TYPICAL FLOODLIGHT CLUSTER on one of the poles used for lighting the driving range consists of two 1500-watt, weatherproof lensed floodlights on top crossarm, with a lensed airplane beacon, containing a 1000-watt projector lamp, between them. Three 1500-watt enameled-reflector flood units are mounted on the lower crossarm. As shown in the overall plan diagram of the park, there are eight pole-mounted clusters of lighting units on the tee-line of the driving range. The top of the "H"-frame of the load center at the rear of the parking lot is at the lower right of the photo. Driving range floods are fed by wires from the top of this frame. Throughout the rest of the amusement park, enameled reflector floodlight units are used with a 1500-watt incandescent lamp in each.

Conducting Labor Cost Studies—IV

How to adjust labor cost units for specific types of work by using data compiled from Job Division Studies. Follow examples illustrated.

By Ray Ashley
Research and Consulting Engineer
Oak Park, Ill.

PREVIOUS articles dealt with the value of break-down and job division studies as an effective check on labor units and a tool for development of labor cost control. This article will show how data from job division cost studies can be used to adjust labor units for particular types of work. Before going into detail, a few explanations of illustrated figures may answer questions which may ensue. A word of caution: One should not focus attention on certain unit costs and neglect to read the explanatory notes and text. The danger lies in an estimator or contractor thinking the entire discussion is out of line because certain labor units used do not compare favorably with his own units.

The quantities used in the following discussion are practically the same as the actual job requirements, except that "round" figures have been used. The percentage change is small. The estimating units have been increased somewhat with the percentage increase being consistent. Because of favorable conditions, the original costs were exceptional. Published units must, of necessity, be near standard.

Some estimators may consider the outlet box units excessive. Note, however, that the conduit units used with these box units are lower than those normally used with "low" box units. Many contractors still have a tendency to figure outlet boxes too low and then have conduit units high enough to compensate for the shortage.

PRICING SHEET — DATE 6/14 1955

JOB OR BLDG. PARSON APTS — LOCATION

BID TO: CONCRETE JOIST CONSTR - 6 FLS + BASEMENT — ADDRESS

ARCHT. OR ENG'R: 106,000 SQ FT - 63 APTS. — ADDRESS

PLANS MARKED: FAST MOVING JOB - GOOD MEN — SCALE — SPEC. NO. — EST. NO.

EST. BY — PRICED BY — EXTENSIONS BY — CHECKED BY — S.O. NO. — SHEET NO.

MATERIAL	QUANTITY	MATERIAL UNIT	EXTENSION	LABOR UNIT	EXTENSION
DIVISION I					
ADJUSTING LABOR UNIT FOR ROUGHING IN BRANCH CIRCUITS					SLIDE RULE ADJ. JOB UNITS
		EST. UNITS	EST. LABOR		
CEILING OUTLETS IN Conc. JOISTS	950	.60	570 —		.55
" " IN SUSP. CEILING	100	.75	75 —		.68
4" SQ. BOXES + 3W. COVERS	2400	.65	1560 —		.59
4" SQ. BOXES + BRKT. COVERS	900	.70	630 —		.64
4" EXT. RINGS + 3W. COVERS	110	.25	27.50		.24
4 11/16" SQ. BOXES	5	1.00	5.00		.91
HANDY BOXES	30	.70	21.00		.64
GEM 3W. BOXES	15	.70	10.50		.64
PLASTER RINGS - 4"	580	.10	58.00		.09
½" RIGID CONDUIT	44,000	.045	2007.00		.041
¾" RIGID CONDUIT	3000	.05	150.00		.045
TOTAL			5114.00		
INSIDE EXTRAS (NOT BUSY)			150.00		
			5264.00		
EST. COST $264.00					
JOB COST 4790.00					
(LABOR RUNNING UP)					
SAVING OVER ESTIMATE - 9%					

ADJUSTED JOB UNITS = 91% OF EST. UNITS

FIG. 1—Job division study with labor unit breakdown showed actual labor was nine percent less than estimated total. Further analysis led to reduction of all units in category by nine percent (right hand column) for use on future work of similar nature.

PRICING SHEET DATE 6/11 1955

JOB OR BLDG. AURORA PARK HOSPITAL LOCATION

BID TO ADDRESS

ARCHT. OR ENG'R. ADDRESS

PLANS MARKED SCALE SPEC. NO. EST. NO.

EST. BY PRICED BY EXTENSIONS BY CHECKED BY S.O. NO. SHEET NO.

MATERIAL	QUANTITY	MATERIAL UNIT	MATERIAL EXTENSION	LABOR UNIT	LABOR EXTENSION
DIV. I - ROUGHING IN BRANCH CIRCUIT CONDUIT & BOXES					
			LABOR HOURS		
			EST. COST	ADJ.	COST
CEIL. OUT. BOXES - CONC. JOIST	175	0.45	78.75	0.53	92.75
" " " - SUSP. CEIL.	125	.60	75.00	.70	87.50
4"SQ. BOXES & BRACKET COV.	140	.60	84.00	.70	98.00
4" " " " SW. COVER	520	.45	234.00	.53	275.60
4" " " " RECPT. "	335	.45	150.75	.53	177.65
4" " EXTENSION RINGS & COV.	170	.20	34.00	.24	40.80
3-GANG SW. BOX & COVER	16	.80	12.80	.95	15.20
6-GANG " " " "	1	1.50	1.50	1.75	1.75
FLOOR BOXES	2	2.0	4.00	2.35	4.70
4 11/16" SQ. BOXES	10	.50	5.00	.60	6.00
PLASTER RINGS - 4"	175	.08	14.00	.10	17.50
1/2" RIGID CONDUIT	15,800	.04	632.00	.047	742.60
3/4" " "	3250	.05	162.50	.06	195.00
1" " "	550	.07	38.50	.08	44.00
1" ELBOWS	30	.20	6.00	.25	7.50
OUTLETS FOR HOUSE PHONES	7	.50	3.50	.60	4.20
PRORATA INCIDENTAL LABOR			75.00		75.00
TOTALS			1611.30		1885.65
JOB TIME - 1,886 HOURS					
EST. TIME - 1,611 HOURS					
EXCESS JOB COST - 17%					

FIG. 2—Upward revision of labor units for branch circuit roughing in on hospital project resulted from this job division time study. Actual labor was some 17 percent higher than estimated. Individual units were boosted accordingly for use on future jobs of this type.

Adjusting Labor Units

When using job division study data to adjust labor units, all units pertaining to a specific study group or category must be adjusted as a group and with the same adjustment factor. There are exceptions which will be noted later.

Fig. 1 lists the materials, plus estimated and actual job labor for a specific work category (Division I) of an apartment house project. In contrast to an estimated total labor of 5,264 hours, the actual labor ran 4,790 hours. The result was a 9% saving in labor hours. Assuming that the results of the study are representative, the adjusted labor units for this particular type of project will be 91% (100—9) of those used in the estimate.

For example: the unit used for estimating ceiling outlet boxes on this job was 0.60 hour per box. On the basis of the job division study, the adjusted unit should be 91% of 0.60, or 0.546 hour. The "round" figure 0.55 is used. Other units are adjusted in a similar manner. The results are shown in the righthand column of Fig. 1.

Note that the labor units for conduit installation were reduced along with those for outlet boxes. These two items always go together. One should not use the conduit unit from a labor cost table without using the *corresponding* outlet box unit, where required. Neither should one pass judgment on the values assigned to outlet boxes until he has studied the conduit unit that is intended to be used with it.

An example of the same division category for a hospital project is given in Fig. 2. Here, both estimated and adjusted labor unit extensions are presented. In this particular job division study, actual labor ran some 17% over estimated labor and the units were adjusted upward. Adjustments made from job division study data of this type may have an important bearing on the outcome of future projects of a similar nature.

Selecting Study Divisions

When a job is separated into many divisions for study, it may be discovered that some section has been fouled up. Such divisions should be discarded and others put into first class shape through analysis and adjustment.

In the previous article (Part III) a report on cable pulling was shown as being incomplete (Fig. 1). Over 100 hours of labor had, by mistake, been charged to other divisions. A review of the records plus a conference with the foreman made it possible to find the incorrect

PRICING SHEET DATE 6/1/55

JOB OR BLDG. PARSON APTS. LOCATION

BID TO ADDRESS

ARCHT. OR ENG'R ADDRESS

PLANS MARKED SCALE SPEC. No. EST. No.

EST. BY PRICED BY EXTENSIONS BY CHECKED BY S.O. No. SHEET No.

MATERIAL	QUANTITY	MATERIAL UNIT	MATERIAL EXTENSION	LABOR UNIT	LABOR EXTENSION
DIVISION II			EST. TIME - HRS		ADJUSTED
PULLING IN CIRCUIT WIRES - LIGHTING & SIGNAL			UNIT EXT.		UNITS - HRS
NO. 18 TYPE "R" WIRE	9000'	5.0/M	45	ADJ. JOB UNITS 86% OF EST	4.3/M
NO. 16 " " "	18000'	5.0/M	90		4.3/M
NO. 14 " " "	125000'	7.0/M	875		6.0/M
NO. 10 " " "	1200'	12.0/M	14.4		10.3/M
NO. 14 " " " (LONG RUNS)	2000'	6.5/M	13		5.6/M
TOTAL			1037.4		
EST. TIME - 1037 HRS.					
JOB TIME - 895 HRS.					
$\frac{895}{1037} = 0.86$ + ADJUSTMENT FIGURE					
DIVISION III					
FEEDER CONDUITS - TEL. & SIGNAL					
1" RIGID CONDUIT	950'	.07	66.5	NOTE: SAME PERCENT ADJUSTMENT NOT USED ON ALL UNITS	.07
1¼" " "	1300'	.09	117		.10
1½" " "	370'	.12	44.4		.12
2" " "	650'	.15	97.5		.15
3½" " "	70'	.28	19.6		.33
1" ELLS & COUPLINGS	10	.20	2		.90
1¼" " " "	50	.30	15		.50
1½" " " "	20	.40	8		.70
2" " " "	15	.60	9		1.00
3½" " " "	3	1.50	4.5		3.00
	300	.20	60		.30
TOTAL			443.5		
EST. TIME - 443.5 HRS.					
JOB TIME - 518.0 HRS.					
EXCESS LABOR - 17% (APPROXIMATE)					

FIG. 3—A common multiplier is not always used to adjust labor units. Much depends on analysis of job conditions. While all units in Div. II (right) were reduced uniformly, those in Div. III remained unchanged or were boosted varying amounts according to operational experience.

charges and thus straighten out all divisions. However, it was considered wise to treat the cable pulling division as incomplete.

As mentioned before, perfect records cannot be expected on all jobs. Frequently, studies that seem out of line are found to be of considerable value when contemplated along with other studies. The Parson Apartment Study had some irregularities and was the work of a beginner. Yet, it yielded information of great value to the contractor doing the work, in addition to the usual benefits inherent with time study analysis.

Adjustments Must Be Made

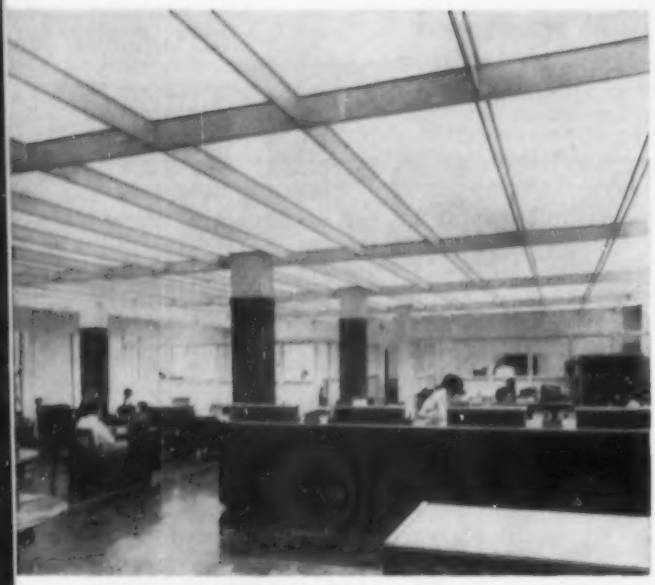
The method of adjusting labor units for Divisions II and III of the apartment house project is shown in Fig. 3. This is essentially a breakdown of the job divisional summary previously shown in Part III of this series. The job figures, after a review of the study and a conference with the foreman, would be closer to the estimated hours.

Full knowledge of actual job conditions has an important influence on adjusting figures. Some particular item may be responsible for a division having total hours above or below the estimated time. In the case of Division II, actual labor was some 14% below estimates and individual labor units were adjusted accordingly. For Division III, actual job time ran about 17% over estimate. In this case, the individual labor units were reviewed and many of them adjusted upward, but not all on the basis of a fixed percentage.

Motor Connection Units

Work involved in connecting motors showed a wide variation between estimated and actual time in the studies explored in the previous article. On the apartment house project, this specific labor category ran 72% over estimate. On the hospital job, it was about 15% over. This is common for commercial type work. It is not always the actual installation time that causes the difference (usually excessive labor). Frequently, job conditions are underlying factors. It is well to use standard labor units to estimate motor work on such projects, but estimators should study the jobs carefully and learn what lump sums should be added to compensate for adverse conditions. In short, this is one case where the facility for making a darned good guess comes in handy.

Labor time studies have been viewed from many angles in this series to date. Their contribution to completed job analysis will be considered in the next article.



OPEN SKY EFFECT of luminous ceiling was created by mounting 100 watt 8-foot slimline fluorescent lamps in continuous rows on 30-inch centers behind corrugated vinyl-plastic panels. This comment-stimulating indication of progressive modernization is a far cry from . . .



ORIGINAL OFFICE SPACE, inadequately lighted by widely-spaced sockets, unattractive due to overhead pattern of sprinkler pipes and beams, subjected to glare from outdoor light entering unshielded windows, and uncomfortable due to poor ventilation.

Translucent Plastic Lighting

HIDES CEILING CLUTTER

Translucent plastic ceiling, installed beneath (and covering) maze of beams, conduits and service pipes . . .

1–Modernizes office appearance and lighting plan,

2–Covers up unsightly overhead construction features,

3–Creates air-conditioning plenum chamber,

4–Incorporates acoustical baffles for sound suppression,

5–Establishes uniform illumination,

6–Permits work-area flexibility, and

7–Leaves operation of sprinkler system unimpeded.



AVERAGE OF 65 FOOTCANDLES provides shadowless glare-free illumination to desk tops, while acoustical baffles and simulated-leather wall coverings promote appearance and reduce noise levels. Prior to this relighting and modernization program . . .



SECOND FLOOR AREA in this downtown-Cleveland office building was dingy, cluttered and completely unsuited to serve as a home-office for the Sun Finance & Loan Company. Modernization cost of $6 per square foot was considered a good investment.

WHEN the fast-growing Sun Finance & Loan Company went searching for larger home-office space in jam-packed downtown Cleveland, Ohio, the only readily-available facilities turned out to be the vacant second floor of a physically-sound but aged office structure. And, like so many other buildings in this typical class, all outward signs belied the full potential of these quarters. For example, illumination (using the term lightly) was provided by unshielded incandescent lamps, minus fixtures, in widely-scattered suspended sockets. Sprinkler heads and a variety of utility piping blanketed the 10,000-sq-ft area. Moreover, deep ceiling beams and unsheathed structural columns were additional visible detractions to the general appearance.

Modernization was definitely in order, and it began at the top, with the installation of a 7-purpose $60,000 Acousti-Luminous ceiling of translucent corrugated-plastic panels suspended 18 in. beneath the true ceiling slab. Panels were supported by a gridwork of acoustical baffles which, in turn, were suspended by hanger rods and concrete expansion anchors. To back-light these panels, 100-watt 8-ft slimline lamps were mounted in continuous rows on 30-in. centers while, to boost interflection values, the enclosed ceiling cavity was painted a flat white.

This luminous ceiling treatment —totalling 5100 sq ft in area and providing illumination for the office lobby, reception area, loan and executive sections—incorporates 214 lamp channels and delivers 65 footcandles of shadowless, evenly-diffused illumination to desk tops throughout the sections lighted in this manner.

The ceiling treatment also accomplishes numerous other objectives, for it (1) results in a beautiful overall open-sky effect, (2) hides all ceiling obstructions and piping from view, (3) provides an enclosed plenum chamber for the circulation of conditioned air, (4) lowers the noise level as a result of the acoustical baffle arrangement, and (5) makes it possible to shift office partitions and work areas at will beneath this overall luminous canopy. Still another advantage is (6) related to the sprinkler system, for the corrugated, lightweight, vinyl-plastic panels are quickly collapsed if subjected either to heat waves rising from below, or to water loads descending from the sprinkler heads above. Being non-combustible, the falling panels then may aid in smothering any flames beneath them and, as they drop from their supporting framework, they leave the sprinkler system unobstructed to function in its designed manner.

Completing the modernization project, the Sun Company vinyl-tiled and carpeted the floors, encased vertical structural steel members in false square marbelized columns, used simulated-leather wall coverings judiciously, placed Venetian blinds over the windows, and refinished furniture to carry out the "new look" in this now-modern commercial headquarters.

To air condition the space, Sun installed eight ¾-ton window units, plus one 5- and one 3-ton self-contained free-standing floor units. And finally, across the exterior of the office building, a 140-ft neon-illuminated sign was installed to attract attention of motorists and passing pedestrians.

As summarized by Sun's president Jack Lampl, Sr., "The luminous ceiling—costing $6 per sq ft—was the most productive investment we made in this entire redecoration program. It not only covered up the eyesore of bare pipes and beams, but it eliminated eye-strain, created an atmosphere of bright expansiveness, and proved to be a tremendous morale booster."

SIX YEARS OF

Electric Heat on Long Island

PROVES ECONOMICAL FOR SMALL RESIDENCE

Accurate record of electric bills shows variation in heating costs with and without sufficient insulation.

CAREFUL recording of monthly electric bills over the past six years by Jerome Proops of Huntington Station, N. Y., makes possible a direct comparison of his electric heating costs before and after proper building insulation was installed.

The sketch shows the residence to be a small, single-story frame structure of 480 sq ft, heated by five recessed 1000-watt radiant glass panel wall heaters, located as shown.

The home when first occupied in the summer of 1949 had no interior trim and no storm windows; insulation consisted of a single thickness of reflective aluminum insulation in the walls and across the tops of the ceiling joists. The wall insulation was stapled to the inside surfaces of the studs and buckled outward between the studs to introduce an air space. No insulation was used beneath the double-wood flooring in the crawl space.

Before the 1949-1950 heating season began, the owner finished the interior trim, added combination

Table 1. Actual Heating Data

	As initially improved by owner[1]	As finally insulated[2]					
	1949-50	50-51	51-52	52-53	53-54	54-55	Average 1950-55
Degree days	5182	4489	4553	4281	4265	4631	4444
Kilowatt-hours	10436	4612	5136	4744	4850	5706	5010
Heating costs	$154	$70	$77	$71	$75	$92	$77

[1] Single-thickness aluminum in walls and above ceiling joists; kraft paper below floor joists; storm sash throughout.

[2] 3½-in. mineral wool loose fill in walls, 4 in. in ceiling; 2-in. mineral wool blankets in floor; storm sash throughout.

Table 2. Calculations

Construction	A — Heat Loss							B — Estimated Annual Consumption[4] (4444 degree days)		C — Estimated Annual Consumption[4] (4989 degree days)	
	Walls (kw)	Ceiling (kw)	Floor (kw)	Windows & Doors (kw)	Infiltration (kw)	Total (kw)	Reduction (%)	Kw-hr	Cost	Kw-hr	Cost
Uninsulated	3.11	3.36	1.40	1.91	2.14	11.92	—	15200	$234	17100	$264
As built[1]	2.36	1.92	1.40	1.91	2.14	9.73	18.4	12400	$191	13900	$214
As improved[2]	2.36	1.92	1.09	0.96	1.07	7.40	29.5	9400	$145	10570	$163
As finally insulated[3]	0.93	0.67	0.42	0.96	1.07	4.05	66.0	5130	$79	5780	$89

[1] Single-thickness aluminum in walls and above ceiling joists; no interior trim; no storm sash.

[2] Single-thickness aluminum in walls and above ceiling joists; completed trim; kraft paper below floor joists; storm sash throughout.

[3] 3½-in. mineral wool loose fill in walls, 4 in. in ceiling; 2-in. mineral wool blankets in floor; storm sash throughout.

[4] kw-hrs = $\frac{\text{kw heat loss} \times \text{degree days} \times 20}{70^\circ}$; electric rate assumed 1.54 cents per kw-hr.

aluminum storm windows and doors throughout, and nailed a thickness of heavy kraft paper to the underside of the floor joists. Addition of this paper created an air space between the paper and the floor, contributing to the insulation of the floor.

Complete heating comfort was not obtained during the 1949-1950 season. Table 1 shows that the heating costs were $154, obtained from the total energy costs by subtracting from each month's bill $7.47, the average bill during the non-heating months for cooking, lighting, water heating, etc.

To cut down these heating costs, mineral wool insulation was added during the summer of 1950. A full thickness of 3½ in. was blown into the wall space, the reflective insulation being left in place. The aluminum foil was removed from the ceiling, and a thickness of 4 in. of loose fill was blown between the joists. Finally, 2-in. mineral wool blankets were placed between the floor joists, supported by the kraft paper and wood lath nailed across the joists.

The heating costs for the next five years show the effect of these improvements. Average cost for the five years was $77, with an average of 4444 degree days. Since the 1949-1950 winter was more severe than the others with 5192 degree days, a proportionate reduction in the $154 bill for that season based on 4444 degree days would give a comparable cost of $132.

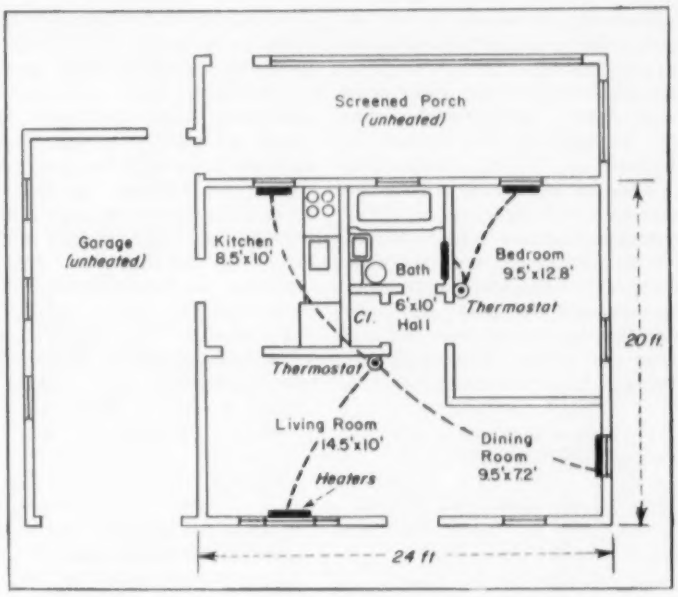
Thus by direct comparison, the improvements in insulation resulted in average savings of $55 a year, or a total of $275 for the five years. Since the home-owner's cost for insulation and storm sash came to $400, the installation will have paid for itself in seven years and will begin paying a profit of about $55 a year two years from now. (To compensate for the original inadequacy of the heating installation, part of the insulating costs were assumed by the builder and the heater manufacturer.) Maintenance since installation has been $22.50, the cost of replacing three broken glass panels. This results in an average annual heating cost over the past five years, including maintenance, of 16.8 cents per sq ft or 2.1 cents per cu ft of heated living space.

Table 2 gives results of heat loss calculations for the home, plus estimated energy costs for various conditions of insulation. Column "A" shows that, had the house been left entirely uninsulated, the total heat loss would have amounted to 11.92 kw. As built, this loss was reduced to 9.73 kw, a reduction of 18.4%. However, heating equipment of only 5-kw capacity was installed, which was only slightly more than half of what was actually required. The improvements made by the owner reduced the heat loss to 7.4 kw, which was still in excess of the installed capacity and explains the first winter's discomfort. Final insulation brought the loss down to 4.05 kw, an overall reduction of 66% from the uninsulated value, which is in line with the installed capacity.

Values given under column "B" show estimated energy and costs based on actual recorded average degree days from 1950 to 1955, while those under column "C" are based on normal degree days for the area and represent averages which could normally be expected for a home of this construction. The extent to which these estimates are varied by weather conditions and personal living habits may be seen by comparing them with the actual costs as shown in Table 1.



GLASS PANEL HEATERS are installed in outside walls below windows. Fan aids in removing excess moisture from kitchen.



FLOOR PLAN shows heater and thermostat locations and room dimensions.

Telephone Co. installs more power for

CROSS-COUNTRY DIALING

New power equipment will handle 350% increase in load for operator toll dialing and air conditioning.

By **H. J. Donnelly**, *N. Y. Telephone Co.*, **R. C. Spellman**, and **H. D. Kurt**, *General Electric Co.*

THE New York Telephone Company at its Franklin Street Building, Buffalo, N. Y., faced a common problem upon installation of its "operator toll dialing"—tremendously increased power demands. This new dialing, plus the use of the office as a switching center, increases the building's initial power requirements over 48%. In addition, the increase in numerous central office apparatus and building loads will, within the design period, involve a demand for the building as now constructed of more than three times the present demands. How to serve this tremendous increase in load and still maintain day-to-day service required the utmost teamwork between the telephone company, the architects and engineers, the electrical manufacturer and the electrical contractor.

Load and Distribution

It was decided to convert all 25-cycle loads in the existing building to 60 cycles. This work involved one elevator bank, certain ac-dc conversion apparatus, and other minor 25-cycle loads—all totalling approximately 300 kva, as compared with some 610 kva at 60 cycles. This load plus new requirements for the changeover totalled 1815 kva, with another 2200 kva anticipated for future loads and air conditioning.

In view of the importance of service continuity to the nation's telephone users and national defense, it was essential that the power distribution system selected be as reliable as possible. The basic design finally accepted to service this grand total of 4015 kva contemplates three 500-kva transformers in existing sidewalk vaults, two future 750-kva transformer sidewalk vaults for air conditioning power, and three new 500-kva vaults built by the New York Telephone Company on an enclosed 6th floor bridge.

Before adoption of this plan, several other possible systems were studied and rejected: (1) A 208Y/120-volt vertical network from a vault outside the basement with all transformers paralleled on a single network bus was impractical because of excessive entrance switch-

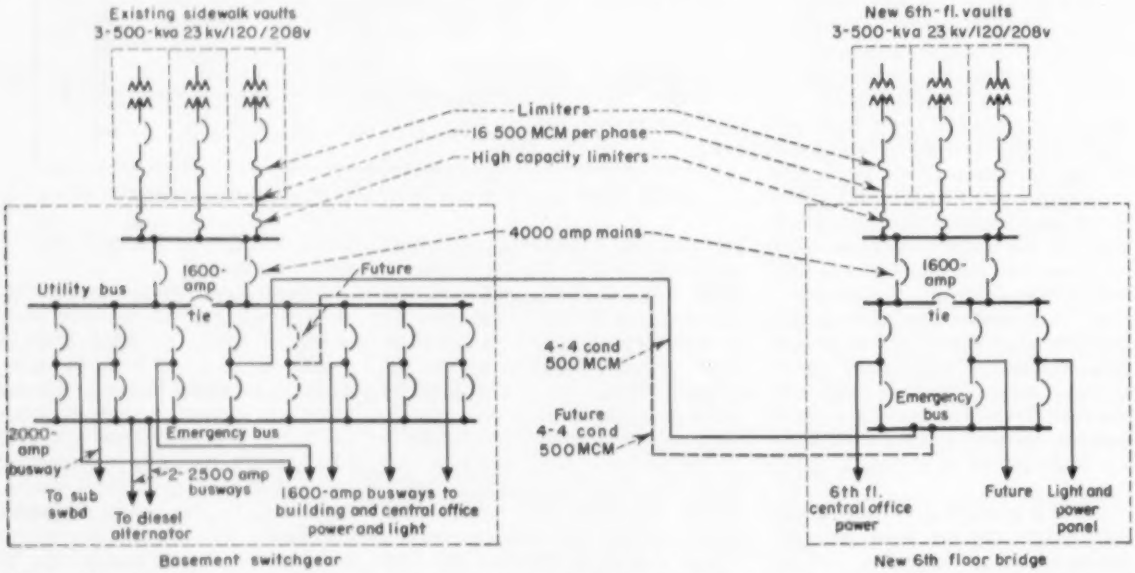


FIG. 1—Network includes two transformer vault locations, one beneath sidewalk, one on 6th-floor bridge. Two future sidewalk vaults are planned to handle air conditioning load.



FIG. 2—Master control station on second floor permits remote operation of switchboard breakers.



FIG. 3—Switchgear in basement includes draw-out air circuit breakers, with provision for feeding from a utility bus or from an emergency bus supplied by a 1000-kw diesel-engine-driven alternator.

gear interrupting current and objectionable reactor voltage drops. (2) A 480-volt spot network from the basement would have exceeded power company vault dimension restrictions. (3) A 4160-volt primary service was not available in the area, and its installation would have been unreliable because of a lack of an alternate source of supply. (4) A 23-kv primary service, though available, would have involved costly associated equipment and did not conform with power company operating procedures.

The double-location 208-volt service adopted is shown in Fig. 1. The power company located its transformers on the bridge and is responsible for their maintenance, while the telephone company maintains the secondary switchgear in both locations.

Switchgear and Busways

For maximum reliability, it was decided that modern draw-out air circuit breakers should be used in the main switchboards. These breakers may be fed either from a utility bus or a diesel emergency bus, with a throw-over scheme that can be selected between the various loads. The regular breaker and the emergency breaker for each of these special loads are electrically interlocked, so that only one may be closed at a time. Each emergency breaker includes an overload relay preset at the load that each individual emergency line can take without overloading the diesel alternator. Main entrance breakers also include overload relays rather than the standard dual magnetic trips to obtain coordination between the utility network protector fuses and the main breakers.

The emergency power will be supplied from a 1000-kw diesel-engine-driven alternator. Ultimately, it is expected that this will be paralleled with a 500- or 750-kw unit. To connect the alternator to the emergency bus in the switchgear, two 2500-amp busways are utilized in parallel.

The emergency bus on the 6th floor switchgear may be fed from either the diesel alternator or the utility power by means of a breaker transfer combination in the basement switchgear. The tie consists of four 4-conductor, 500MCM aluminum tape-armored outdoor cables strapped every 18 in. to an aluminum ladder-type cable rack up the outside of the building. Rack space has been provided to accommodate an additional set of cables to double the emergency capacity. Blank cubicles in the switchgear were included to receive breakers for this second set of cables.

The major concentrated loads of the building are fed through busways. A 1600-amp bus from the main switchboard services each group of feeder breakers in the basement; a 2000-amp bus ties an existing sub-switchboard to its transfer combination; a 1600-amp bus feeds a basement central office power plant; and a 1600-amp bus from the 6th floor switchgear feeds a 6th floor central office power plant. In addition, stubs have been furnished for future anticipated concentrated loads.

Grounding

The extremely high fault currents available made necessary a ground path with as low a resistance as possible. In the basement, a grid of ¼ by 3-in. copper bars has been cast into the floor beneath the switchgear. The ground buses from the main and distribution boards are tied to this grid. A grid is also cast into the floor of the 6th floor bridge under the switchgear and transformers, tied to the switchgear ground bus and transformer cases. Both networks are connected together with two ¼ by 3-in. bars which run vertically up the building.

Around the courtyard manhole, eight zinc slabs have been buried to provide a low-resistance ground path. The water table in the area is high enough so that no difficulty in maintaining the ground is expected. The zinc slabs are connected to the ground network with multipled 500 MCM cables. A ¼ by 3-in. copper bar has been installed to tie the entire system to the water main and to the skeleton steel of the building.

Ground continuity to large rotating machines was supplemented with a ¼ by 3-in. uninsulated bus on all feeders to concentrate power loads. Where the duct enters the switchgear, this bus is connected to the switchgear ground.

Feeders in conduit to power panels utilize grounding type bushings where the conduit enters or leaves any box. Each box is furnished with a ground lug brazed to the spot and connected to the grounding feeders with green-coded cables. This same method is used on individual feeders to motors except that flexible metallic conduit is not considered adequate to maintain ground continuity. Wherever it is used, an additional green-coded cable has been installed. This has usually been run from the motor

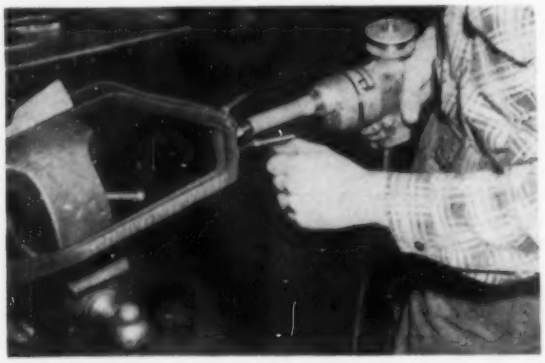
(Continued on page 132)

Shop Ideas Save Production Dollars

. . . at Reed Electric Company's motor repair operation in Portland, Oregon. Overall time economy leads to better customer service and a brighter profit picture.



MACHINE TAPING of leads on form coils with cotton or v.c. ½-in. or ¾-in. tape by means of aluminum cone attachment on standard taping machine. Method saves from six to eight hours over hand method on 144-coil job. Tape is used instead of sleeving to prevent post dip-and-bake cracking when leads are bent to make coil connections.



PIGTAIL SPINNER attachment on heavy-duty ¼-in. electric drill bands wire tightly around form coil leads in stator to make vibration-proof connections. Banding wire passes from spool through hole in drill housing and shaft to slotted steel tube with fiber covering. Tube fits over coil ends. Spinner cut connection time on 144-slot from 2 hours to 10 minutes.



BELT SANDER on table-height pedestal provides an efficient way to remove burnt solder from rectangular copper and to clean ends of salvaged coils. Reed finds this method better than most buffing techniques.



MEASURING TEMPLATE on table adjacent to taping machine is used to mark coil ends for lead-taping. Marking and taping is done before coil goes to spreader, insuring uniformity of appearance and ease of connection.

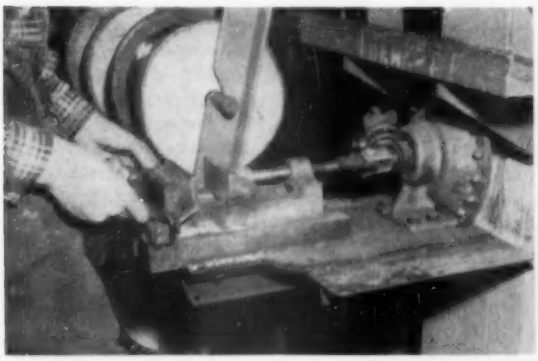


WORK PEDESTAL made from sections of 8-in. I-beam and 6-in. channel holds stator in any position and takes less space than conventional workbench. Lower channels hold tools and materials; pedestal bracket supports coils.

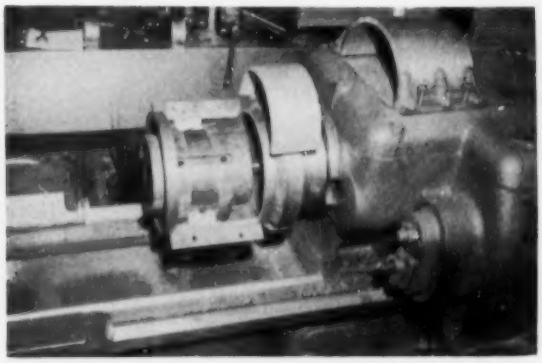
THAT shop ideas pay off is a well established fact at Reed Electric Company in Portland, Oregon. It is almost an axiom with brothers John and Roy Reed, who never disregard an idea no matter how small or inconsequential it may seem at first. Experience has proved that, more often than not, such ideas or "shop kinks" provide time economies that contribute to an increase in production efficiency. Translate minutes and hours saved into dollars and cents and you have a basis for an operation that offers better customer service, better workmanship and a healthier profit picture.

A tour of the Reed shop emphasized their adherence to this principle. In almost every phase of their repair operation, several methods stood out as unquestionable time savers. On some, it meant clipping a few minutes off an operation; on others it represented several hours. Whether taken individually, or collectively as an over-all operation, the net result was the same: better workmanship, less time and fewer dollars needed for production.

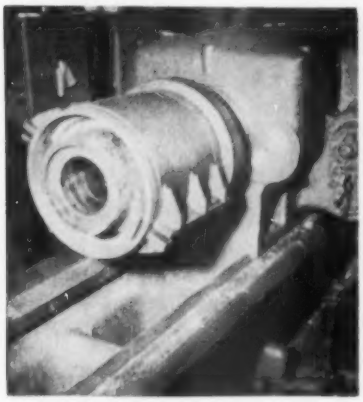
Ten of Reed's time-saving ideas are photographically illustrated. Some were designed to meet special shop and job requirements. Others were developed to speed up and simplify operations common to most motor service shops. Study these photos carefully. One or more of these methods may well fit into your own repair operation.



PNEUMATIC VISE effectively removes bends and kinks in rotor and armature bars and rectangular copper coils. Movable jaw of a machinist's vise is coupled to an air cylinder from a Ford truck air brake. Foot control leaves both hands free to hold copper. The tool saves considerable hand bending and hammering, and reduces waste.



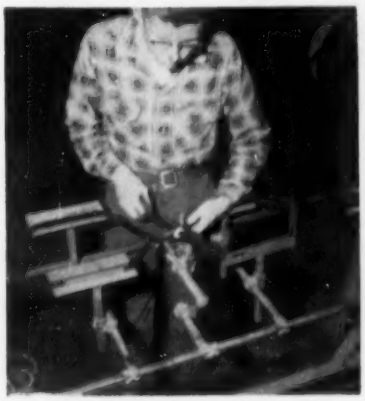
VIEW OF A disassembled bearing mandrel showing machined parts and position and support of bearing casting. Mandrels are somewhat expensive to make, but pay off for the type of work done in the Reed shop. Normal trial-and-error hand alignment in regular chuck takes time, increases possibilities of inaccurate machining.



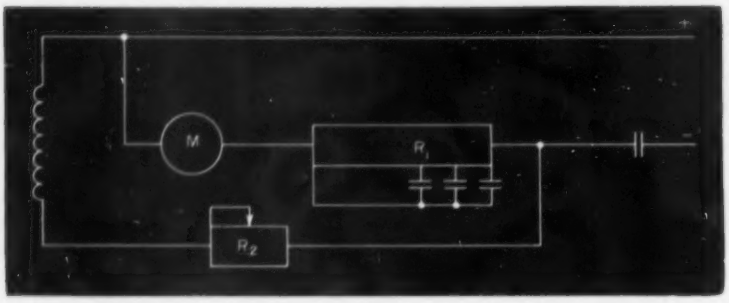
BEARING MANDRELS increase boring accuracy on split-sleeve Babbitt bearings. Machined mandrel is welded to a lathe face-plate; holds casting securely; duplicates bearing position in motor end-bell; eliminates time consuming alignment in 4-jaw lathe chuck. Boring time reduction on two bearings is about 25%. Reed now has five mandrels for 2-in. to 6-in. bearings. They have demonstrated their worth in time saved, more accurate results and reduced waste. The shop intends to add about 15 more to their supply within the next year or so.



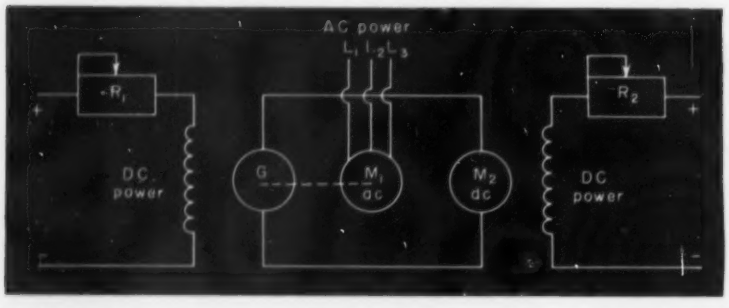
HOOK-ON PLATFORM holds magnet wire reel away from storage rack so hoist saddle can be attached. Method solves wire handling problem in 8-ft. ceiling area. The 18-in. by 10-in. platform of 2-in. angle-iron hooks on side of 6-in. channel supporting reels. Light-weight ½-ton hoist with aluminum housing can be moved easily to serve three 3-tier rows storing some 180 reels of wire. Platform, stored at end of rack when not in use, is simply hooked over angle iron in front of reel desired; reel is rolled out of rack onto platform; and hoist chain is attached.



FORM COIL JIG on angle-iron frame simplifies connecting individual form coils for definite slot grouping. Adjustable brackets hold coils so ends can be stubbed, soldered and taped (with portable taping machine) before being placed in slots. Bending coil (at left) back 180-degrees over special clamp forms nose at junction point and places coil in natural slot position. Method provides more working space and substantially cuts connection time. This method also permits stator to be worked on at the same time the coils are being connected.



ELEMENTARY DIAGRAM of dc motor with rheostatic control and resistor in series with armature. Motor starts with full field strength, then speed is increased by adding resistance to field winding, short-circuiting resistor.



AC MOTOR drives dc generator which delivers power to dc motor driving the load. Speed of dc motor is adjusted by changing generator voltage, and motor is reversed by reversing generator field. When load on dc motor is negative, power is returned to ac supply by operating ac motor above line voltage.

DEVELOPMENT OF . . .

Magnetic Amplifiers

. . . broadens field of motor control by furthering basic objectives of resistors, m-g sets, electronic tubes and generator-field exciters.

By H. D. James
Consulting Engineer
Pittsburgh, Pa

EVER since the electric motor came into being some 75 years ago, engineers and maintenance men have been seeking practical methods for controlling such variables as speed, voltage, frequency and power. To be acceptable, however, a controlling device had to meet several basic requirements. For example, it had to be simple in principle so that it would be easily understood by those operating and servicing it. It also had to be rugged in construction, reliable in use—giving maximum trouble-free service while requiring minimum attention and maintenance.

For all these reasons, a relative newcomer to the field of motor control is attracting favorable attention, for this industrial youngster has no bearings or moving parts, no commutators or brushes, no tubes or delicate mechanisms. It is rugged and reliable; requires no warming-up period; demands little maintenance. Furthermore, it is compact, and it has such a small power loss that heating is not a limiting factor.

This control device, the magnetic amplifier, is similar to a transformer in that it is a static unit having two separate windings on a common iron core; a construction characteristic which also distinguishes the simple saturable reactor. Basically, one winding carries a direct current control signal while the other winding carries rectified ac to the load. Power from the ac source flows either freely or restrictedly in accordance with the degree of saturation in the iron core. And, since this saturation is governed by the magnitude of excitation in the dc winding, it is apparent that a small amount of dc can control a large amount of ac load power. Therefore amplification is obtainable in major amounts.

Actually, the magnetic amplifier consists of dual saturable reactors, plus dry type rectifiers and resistors; and the amplification factor has been greatly increased through self-saturation of the iron core; i.e., by applying part of the load current to augment the action of control power towards this end. Higher amplification has also been improved through developments of better core materials and dry type rectifiers—developments which have likewise resulted in extremely low reverse currents, fast responses

and high gains, thereby making this device applicable to the whole field of automatic control and regulation.

As to potential applications, its possibilities are vast, for it can be used to adjust a wide range of variables. In fact, it may be applied directly to a dc motor or it may control voltage of an m-g set which in turn delivers power to a dc motor. It can also deliver controlled amounts of power to a rectifier that converts power to dc; this resultant power being applied to either the armature or field of a dc motor (or both), and this motor can then be connected either directly to a load, or used to control the field of a generator delivering power to another motor to drive the load.

Response of a magnetic amplifier is initiated by small adjustable rheostats connected in series with control coils that regulate the control flux in the amplifier. And, where several different circuit conditions are necessary or desirable to obtain variable speeds, a corresponding number of control coils may be provided for these purposes.

An example where variable speed is necessary can be found in a paper mill, where the speed of rotating a paper-winding spindle must be progressively slowed down as layers of paper on the spindle increase and the resulting diameter of the roll becomes greater. This slowing down is necessary so that paper tension will not build up to the rupturing point. To obtain constant tension, current signals from the motor armature are matched against a reference signal, differences are amplified, and motor field current is adjusted by a magnetic amplifier to hold armature current constant. (See Magnetic Amplifier Controls, EC&M, Sept. 1952).

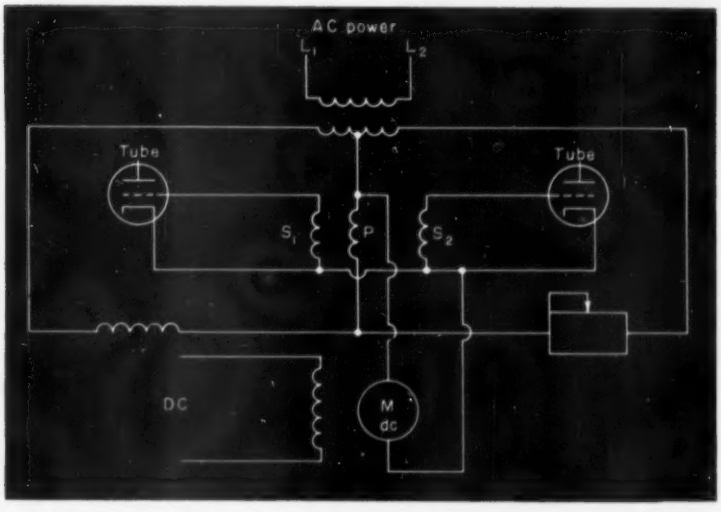
Of course, many motor applications do not require such critical speed control and (for such general-purpose motor drives as those used for cranes, hoists and machine tools now using rheostatic controls) magnetic amplifiers with only one or two control coils can be used advantageously.

Speed of response is dependent upon the speed of change in the magnetization which (since the development of special irons to replace commercial iron cores) can be quite abrupt. (Fig. 5). As an indication of relative speed, it may be stated that the magnetic amplifier responds faster than a standard relay, because a relay must open or close a control switch to cause a change in an electric circuit, whereas a magnetic amplifier changes the current directly without having to operate the intermediary switching means. It is due to this rapid method of changing circuit current that motors can maintain such accurate load or speed conditions.

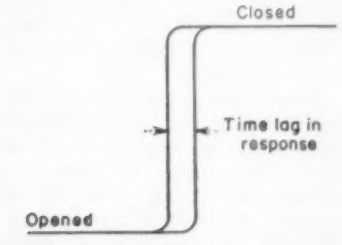
Regardless of whether control tasks are complex or relatively simple, magnetic amplifiers have a promising future and they should grow in popularity as their potential applications become more widely known.

Links in the Control Chain

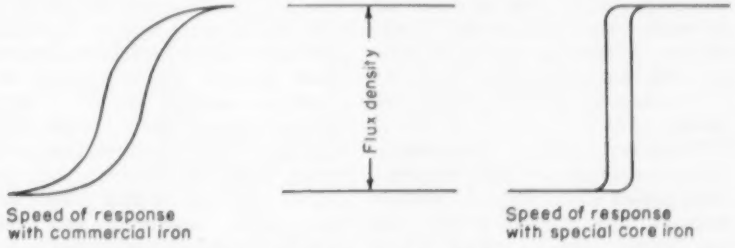
As mentioned at the beginning of this article, the subject of motor control has been receiving attention from engineers ever since electric motors began to replace steam engines; when street cars started using series, and elevators began using shunt dc motors. Therefore the development of the magnetic amplifier is only a link in the continuing chain of control devices, joining such worthy predecessors as resistors, m-g sets, electronic tubes and various types of exciters to control generator fields of m-g sets furnishing power to working motors. Many of these predecessors are still giving excellent service



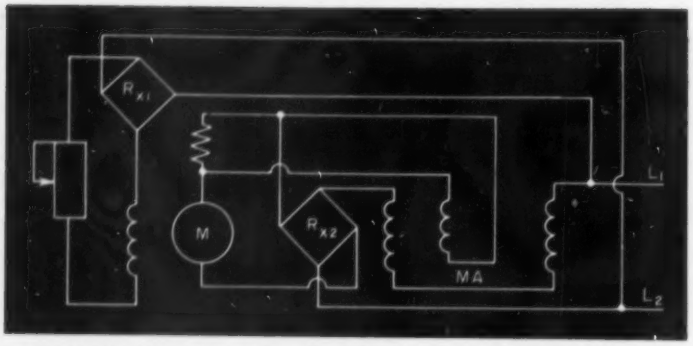
PHASE SHIFT of grid potential wave is obtained by changing phase angle between primary (P) and secondary (S1&2) windings of control transformer, thereby controlling speed of dc motor.



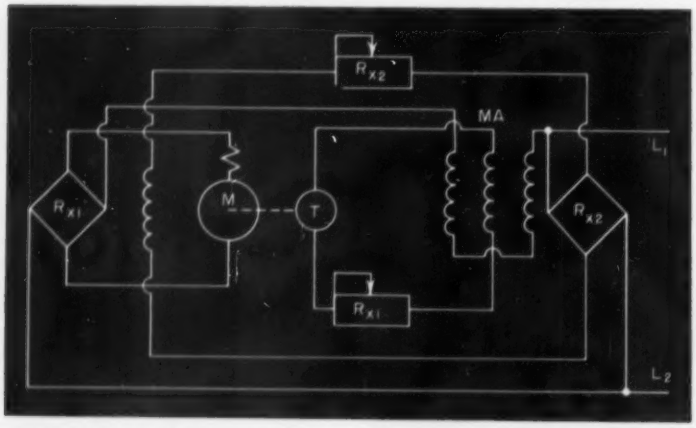
RELAY opens quicker than it closes, although intermediate period is negligible. Time lag in response is due to mechanical action of switching mechanism.



MAGNETIC AMPLIFIER changes impedance within limits of hysteresis loop, with response being quite abrupt when special iron is used for core.



MOTOR LOAD is measured by voltage drop across motor interpole windings. Speed is adjusted to maintain constant load.



MOTOR SPEED is measured by tachometer generator (T) through control coil on magnetic amplifier. Motor receives power through ac rectifier RX1. Increase in motor speed is checked by magnetic amplifier which increases voltage across motor field, reducing speed to normal. Reduction of motor speed likewise reduced motor field, thereby returning speed back to desired speed.

and still have many modern applications.

For example, speed control was primarily obtained (prior to 1900) by inserting a *resistor* in the motor circuit, and this early method will continue to be used whenever close speed regulation is not essential. Resistors could be inserted in either the armature or field circuit of a dc shunt motor and, when adjustable speed for ac induction motors was required, it was obtained by providing three slip rings in the motor's secondary circuit, thereby enabling resistors to be connected for the purpose of controlling motor speed.

Whenever resistors were used in either armature or rotor circuits, they caused reductions of speed or load by proportionately reducing the power. Or, in cases where speed was to remain constant, resistors would be adjusted in accordance with variations in the load. This type of control is still widely used; a good example of the application being found in control devices for electric cranes and similar equipment.

A second link in the control chain came into being in 1907, when a Chicago steel mill installed a large dc motor to drive the main rolls of a reversing mill. This motor received its dc power from an *m-g set* driven by an ac slip-ring motor. The m-g set was double-acting in that (through the inertia of a heavy flywheel) energy would be expended when the load was maximum, and would be partially recovered when the load dropped below normal. This method of mechanical storage soon found other applications, and the use of m-g sets is still quite common, with individual m-g sets usually related to individual motor applications.

About 1935, *electronic tubes* started to replace m-g sets in controlling motor voltages and, because tube controllers were light in weight and small in size, they were used widely in planes and ships for gun-firing purposes. Their fragile construction, however, greatly reduced their useful life, and frequent inspection and maintenance was an essential chore where the application involved hard usage.

Shortly afterwards, special types of *exciters* were developed to control m-g generator field currents; such exciters including General Electric's Amplydyne, Allis-Chalmers' Regulux, and Westinghouse's Rototrol. Although differing in principle and construction, all of these exciters had the same objective: to accurately and quickly adjust the generator field in order to maintain speed or load of a working motor at an exact predetermined value without requiring constant supervision.

In mentioning devices contributing to the progress of motor control we should include the *rectifier*, which changes ac to dc before it is delivered to the motor or generator field winding. Static in design, that is, without any moving parts or any electrical contacts in any part of the magnetic control system, the selenium rectifier already is in wide use while the silicon rectifier is gaining recognition and acceptance due to several features which will extend the use of rectifiers to applications formerly not included.

To complete the picture of control, brief mention should also be given to such devices as hydraulic and magnetic couplings, and mechanical speed reducers designed for use with squirrel-cage induction motors. In this connection it should also be mentioned that the speed range of a coupling or squirrel-cage induction motor is limited by its heating; this heat loss in the coupling or motor secondary winding being proportional to the load multiplied by the amount of speed reduction. This heat, of course, must be absorbed or dissipated, either by water cooling or by adequate ventilation.

Since there is a constantly growing demand for adjustable-speed motors, the subject of control will merit continuing attention and development. And, with the impressive progress of the past as a heritage and background, future developments can be depended upon to fully meet the challenge of modern industry.

CAPACITORS CUT POWER COSTS—II

And Increase System Capacity

Performance records—related to capacitor installations in 12 Cleveland industrial plants—verify reliability of available design data, and illustrate benefits of improved power factor, decreased voltage drop, greater wiring capacity and reduced power bills.

INASMUCH as the 12 industrial plants included in this survey are all served by a local utility company (CEI) which includes a power-factor clause in its rate structure, there were tangible economic incentives for these companies to improve their pf to values above the utility's rate-base standard of 85%.

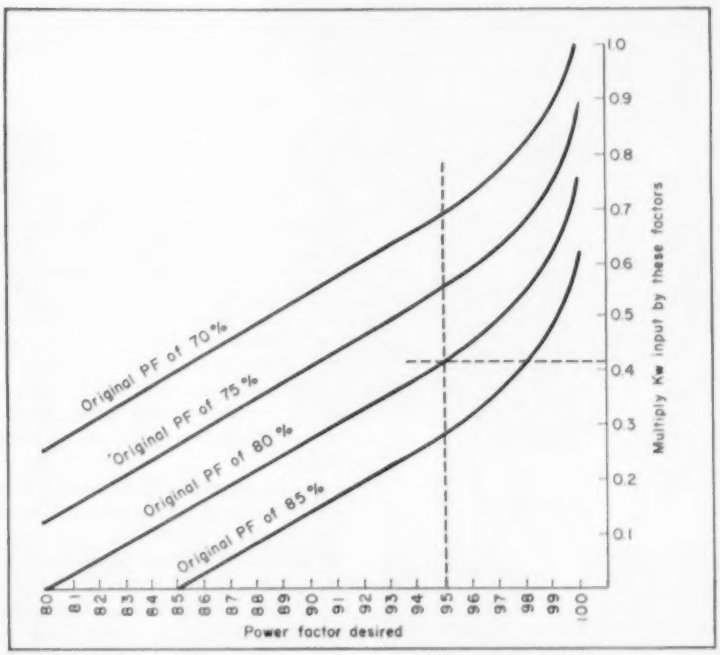
All details of the rate structure will not be discussed here, yet it is pertinent to mention that demand charges are obtained by multiplying the metered kva demand by the ratio between the rate-base pf (85) and the pf actually existent in the plant being billed. It is evident, therefore, that the ratio will be greater than unity when a plant's pf is less than 85%, but that it will be *less* than unity if the plant's pf is *greater* than 85%. A power bill will correspondingly reflect an increase or decrease in proportion to the fluctuation of this ratio.

In recommending the installation of capacitors as a means for improving power factor, most of the consultants had explained to management that the kva which was metered and billed was actually only an *apparent* current, equivalent to the vectoral summation of the *working* current (kw) driving induction equipment in the plant, and the *magnetizing* current (kvar) required to produce flux in these various magnetizing devices. In other words, the apparent current is equal to the hypotenuse of a right-angle triangle, the two short legs of which represent these kw and kvar values.

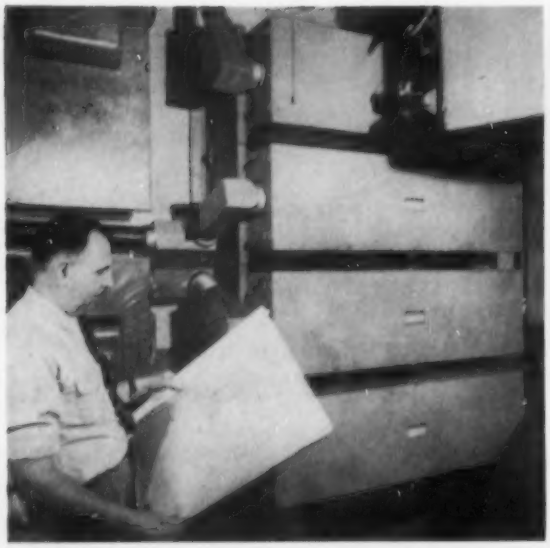
This is shown graphically in an accompanying diagram, where a working current of 100-kw is taken as the basic leg. As indicated, the apparent current in this instance would be 141.5-kva when the power factor is 70%, but this apparent current would be progressively reduced to values of 134, 125, 118, 112 and 105 as the power factor progressively improves to 75, 80, 85, 90 and 95%.

The diagram also indicates that a magnetizing current of 102-kvar is supplied by the power line when the pf is 70%, but that only 33-kvar are involved when the pf has been improved to 95%. This indicates that, if the required kilovars can be furnished from a source other than the power line (such as from a capacitor bank), the resultant plant pf will be improved correspondingly, the apparent (metered) current will be lessened, the power factor multiplier (ratio of 85 to actual plant pf) will be reduced, and that the utility charges will be lowered as a result.

In the illustration here presented, the diagram shows that the power



REACTIVE CAPACITANCE necessary to improve power factor can be estimated by locating intersection point between original and desired pf, noting value of right-hand column, then multiplying plant's average working current by this value.



INSTALLED OVER A WEEKEND, these four 120-kvar capacitors involved no interruption to production. Plant manager reports noiseless operation, minimum maintenance, negligible depreciation, pf improvement from 70% to 98%, and amortization from savings in 21 months.

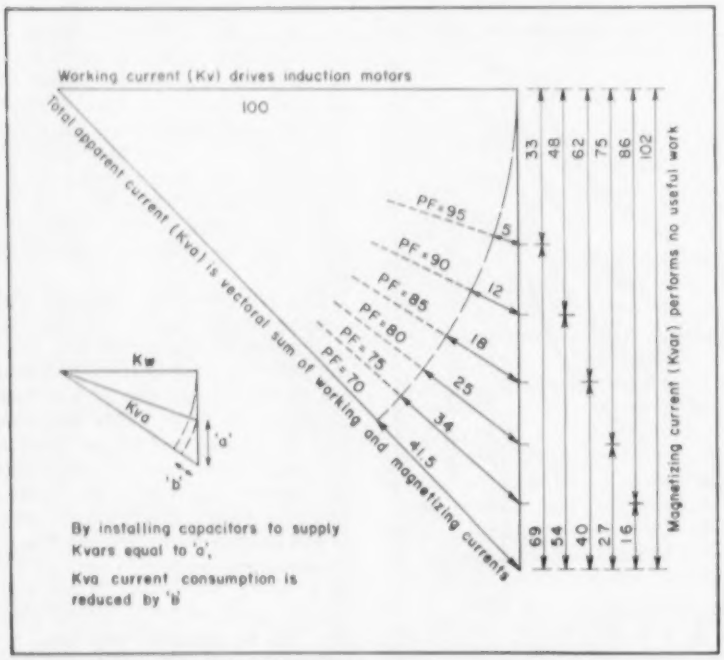


ELECTRICAL CONTRACTOR (Grant Electric of Cleveland) installed these 6- and 12-unit capacitor racks (total capacitance 135-kvar) during annual plant-inventory shut-down period. Total cost (labor, materials, related switching equipment, insurance, taxes and overhead) was amortized in 26 months.

factor can be improved from 70% to 80% or 90% by installing capacitors on the line having ratings of 27 or 54 kvar.

The illustration and diagram just discussed pertain only to an installation having a basic induction working current of 100 kw. Required capacitance for an installation of *any* size, however, can be estimated by referring to the series of curves (representing power factors of 70, 75, 80 and 85).

Use of these curves is fast and simple. For example, a small industrial plant, with an average working current of 100 kw and an average pf of 80%, wishes to raise its pf to 95%. Therefore the user of the curves would locate the point on the 80% line directly above the desired 95 pf mark, then look to the right-hand scale to find a multiplier (in this case 0.42). Then, by multiplying his basic working current (100 kw) by this factor, he would find that capacitors furnishing 42 kvar are necessary. By selecting the nearest standard-sized unit to this value, he would install 45 kvar and actually wind up with a pf around 96%.



PLANT POWER FACTOR IMPROVES and kva current consumption correspondingly decreases as magnetizing current supplied by the plant's distribution system becomes smaller. This can be accomplished by obtaining magnetizing current from other sources, such as from capacitors.

It will be noted that all of these curves approximate straight lines up to points where the desired pf becomes 95%. Beyond these points, the curves sweep gradually upwards, indicating that the multiplying factors (at the right) increase more rapidly in this section of the chart. Since these factors determine the amounts of reactive capacitance required for pf improvement, it is seen that the law of diminishing returns enters all economic considerations when desired pf approaches the 97-to-100% range.

As an example, in the small plant just discussed where average working power was 100 kw and initial pf was 80%, it was found that the installation of 45 kvars would raise pf to 96%. At $13.32 per kvar, this installation would have cost approximately $600. It would also have resulted in lowering the monthly demand by 21 kva. And,

"Costs less to buy...



costs less to install"

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Single standard wrench quickly installs every size from 2/0 to 1000 Mcm. Rounded edges, recessed bolts for rapid, neat taping. No parts to lose —washers retain bolts during installation.

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by a registered professional engineer to contain not less than 67.32% new Neoprene

We certify that the jacket of all cord or cable branded "Bronco 66 Neoprene Certified" contains not less than 67.32% of new Neoprene.

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NEW 66% NEOPRENE JACKET

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Never before—not even by Bronco—has so much Neoprene been successfully put into a portable cable jacket. You get more for your money—more Neoprene—more protection. Now, all the things that Neoprene has always done so well are done even better by Bronco 66 Certified.

Bronco 66 Certified is a safer cable—a product of greater value to you. Because it contains more Neoprene—more than any other cord or cable on the market—it gives greater protection against ... OIL, GASOLINE, KEROSENE, FLAME, SUNLIGHT, OZONE, HEAT & COLD, WATER, ABRASION, SCUFFING, TEARING, CRUSHING, IMPACT, FATS AND GREASES, ACIDS, ALKALIES, SOLVENTS, all of the elements found in industry that are the natural enemies of cords and cables.

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manufactured by

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now available internationally through Electrical Wholesale Distributors

WRITE FOR NEW CATALOG

new carton



with knock-out top—for convenient dispensing. Keeps store room neat. Notice king-size label for cross-the-room reading.

increased flexibility, too!

Capacitors Cut Power Costs

. . . Starts on page 103

assuming that the monthly demand charge is $1/kva, this installation would pay for itself through savings in 29 months.

However, if it became necessary to raise the pf to a full 100%, an installation of 75 kvars would be necessary, having an installation cost of approximately $1000, effecting a monthly saving of 25 kva, and resulting in a 40-month amortization.

This comparison indicates that it would cost $37.50 for each 1% increase obtained in pf between 80 and 96%, but that it would cost an extra $400 to obtain an additional 4% pf improvement.

Both installations would eventually pay for themselves through savings, yet it is apparent that the amortization period would be materially lengthened if the higher pf was sought, and that the rate of return on the investment would be correspondingly reduced. For that reason, some plant managers might be satisfied with an eventual pf of 95% or 96% (with a very gratifying power bill reduction), whereas other managers might decide that the higher investment (and slower amortization) would be justified to obtain greater system capacity, lower voltage drop, higher motor efficiencies, or the like.

Testimony Proves Performance

It was both surprising and encouraging to find that the large majority of men interviewed during the survey (maintenance foremen and electrical engineers, on up to production superintendents, factory managers and company treasurers as well) were thoroughly indoctrinated with facts related to the purpose, function, construction details and benefits related to their respective installations. This general knowledge indicated that initial promotion (by utility and manufacturer representatives, consulting engineers and electrical contractors alike) had been widespread, factual and effective, and that subsequent "shop talk" had indoctrinated the "front office" with engineering details, and had acquainted the "men with the tools" with resultant bookkeeping economies.

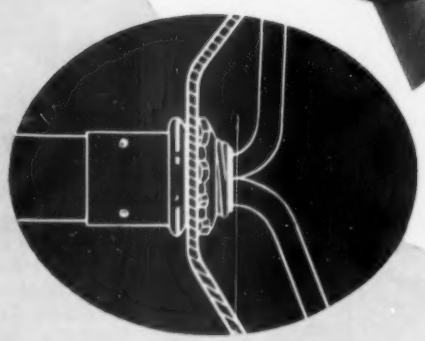
For example, one engineer (R. C. Grow of Reliance Electric and Engineering Company) commented,

Red Throat

B-M 21 B, THE NEW INSULATED THROAT INDENTER CONNECTOR FOR E. M. T.

Four Ways Finer





1. Protruding rounded red plastic lip of bushing prevents cutting of insulation—eliminates shorts.
2. Full thread screws into all conduit fittings. Lip of RED THROAT bushing protects thread from damage.
3. Deep dished eight pronged lock nut is easier to drive on—screws flush to shoulder and digs into metal of box for vibration proof positive ground.
4. Permanent locked-in bushing insures smooth burr-free raceway for easy fishing. No extra work and costs no more.

Briegel, the Original Indenter Fittings are neater in appearance, easier and faster to use. Installation is simple and less expensive. Two quick squeezes sets them forever. Try B-M Indenter Fittings and get more profits from each job!

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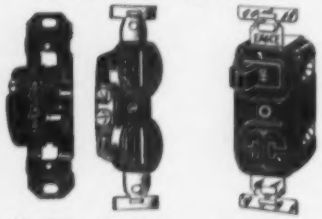
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- COMPLETENESS—one purchase order, one shipment, one invoice, better stock control saves time and reduces handling costs.
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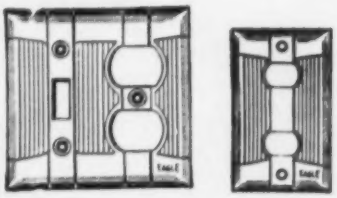
"PERFECTION IS NOT AN ACCIDENT"

SWITCHES and RECEPTACLES



No. 787 Toggle Switch — No. 736 Duplex Receptacle — No. 798 Combination Switch and Receptacle

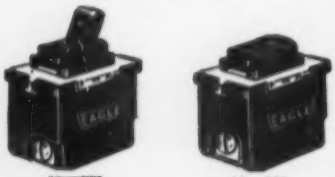
EAGALINE and INTERCHANGE PLATES



No. 138 Combination Plate — No. 952 2 Device Plate

INTERCHANGE DEVICES

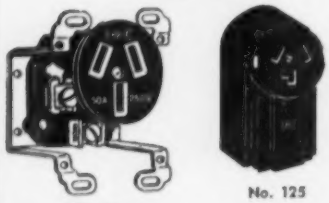
Interchangeable With All Standard Lines



No. 901 Single Pole Switch — No. 902 Power Receptacle

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No. 122 Range Receptacle — No. 125 Dryer Receptacle

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15-20-25-30 Amp

STOPS NEEDLESS FUSE BLOWING Caused by temporary overloads that occur with starting of motors in appliances and equipment.

CARTRIDGE FUSES



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Illustrated above are only a few of the Eagle line of 1400 wiring devices. They are the result of constant research by highly skilled engineers, production experts and experienced factory employees, quality conscious.

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LONG ISLAND CITY 1 • NEW YORK

"Perfection is not an Accident"

Capicators Cut Power Costs

. . . *Starts on page 103*

"Due to our capacitor installation, power factor was boosted from 82% to 95.6% and we rang up a neat monthly saving of $127. These savings should remain relatively continuous, too, for maintenance consists merely of an occasional fuse inspection. Paul Mehnert (consulting engineer) has our sincere thanks for his recommendations."

A factory manager (Fred W. Exton of Cleveland Brass Manufacturing Company) gave credit to his electrical contractor when he said, "Grant Electric installed a 6- and a 12-rack capacitor assembly during our annual January inventory shutdown, so production wasn't affected. The total installation (for units, labor, insurance, overhead, inspection and sales tax) amounted to $2400 for 135 kva, and the installation paid for itself in 26 months. Our decision to install capacitors was strictly a dollar-and-cents one, but we also picked up extra capacity for future expansion and we have eliminated the former headache of blown fuses."

Another favorable comment came from a production manager (G. E. Sears of Lempco Products) who explained that, "Due to stepped-up production of mortar shells in our plant during the Korean war, our motorized machines increased in number from 72 to 257; our connected load climbed from 500 to 4800 hp, and our demand jumped from 130 to 1550 kilowatts. To handle this demand, we added transformer and feeder capacity, installed plug-in and trolley ducts. Yet power factor remained down around 70%, while low voltage adversely affected the efficiency of motors and lighting. The answer was finally provided through the installation of 600 kilovars of reactive capacitance. Now our power factor is up to 98.9%. Even our largest motors (40 hp) start up instantly and, with all machines in the shop running, we no longer notice dimmed lights."

A maintenance foreman (Fred Young of the Acorn Refining Company) continued the favorable testimony, commenting, "Our monthly power bills are now down about $50, but that is only one of several worthwhile results. Formerly we had a production interruption every week or so due to overloaded lines. That is now a thing of the past. And

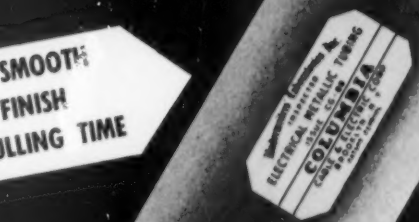
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NEW

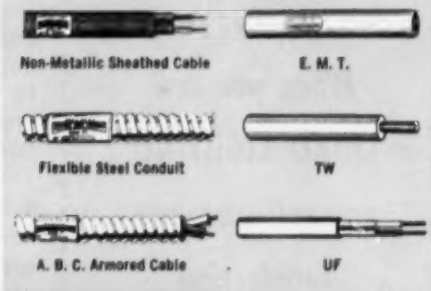
NEW—OUTSIDE FINISH SMOOTH AND EASY-TO-HANDLE

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FOR FISHING SPEED
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Columbia E.M.T. is new—inside and out. The new Columbia E.M.T., with the recently perfected interior finish, speeds fishing and wire pulling. See for yourself—try Columbia E.M.T. on your next job.

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ALL MOISTURE AND NON-COMBUSTIBLE DUST CONDITIONS PROVIDED FOR WITH THIS LINE

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When you sell QUAD LIGHTING *you sell customer satisfaction*

DOES IT IN A BIG WAY FOR YOU...

These units, with heavy cast hoods, are made in vertical, horizontal, and outlet box types. The reflectors are porcelain enameled acid-resisting white inside and green outside. Listed as vapor-tight by Underwriters' Laboratories.

The heavy cast hoods of vertical and horizontal types are tapped for ½-inch pipe—¾-inch when specified. A new cast box type has four screw holes and an exterior gasket to seal joint between fixture and the 4½" cast box. Outlet box type fits regular 4" box. Threaded joints are sealed with durable gaskets.

For indoor and outdoor reflectors for every industrial need you'll find QUAD has the types to assure customer approval.

QUADRANGLE MFG. CO.
325 S. PEORIA ST. · CHICAGO 7, ILL.

Capacitors Cut Power Costs

. . . *Starts on page 103*

installing capacitors, plus converting to motor drive, has boosted our production 30%."

A plant superintendent (J. W. Hill of C. O. Bartlett & Snow) emphasized his approval with the information that, "We took the advice of a CEI utility engineer, locating 90 kvars in capacitors high up on the structural columns near the load center of our manufacturing department. The units take no usable production space; they require no maintenance; they have no moving parts to wear out; they have corrected our overloaded conditions; they have also corrected our power factor, and they paid for themselves in 13 months."

Still other favorable comments came from a plant superintendent (Frank Pokorny of Monarch Cap Screw & Manufacturing Company), a chief electrician (L. N. Haag of Fruehauf Trailer), and a production manager (Eric W. Nyros of Grant Photo Products), who, collectively, added, "Besides direct savings in power costs, the installation of capacitors and busducts reduce our electrical maintenance 25%." "We have a large inductive load but capacitors give us rated voltage and now keep machines operating at rated efficiency." "Capacitors make a lot of sense when you're modernizing and rewiring. But best of all, they start paying for themselves immediately."

Comments from other men interviewed were equally enthusiastic. "The use of non-flammable non-explosive dielectrics eliminate the necessity of a fireproof vault," said one. "The dust-tight design fits into any plant layout we might wish to adopt," said another. "All live parts are enclosed so accidental contact is impossible," said a third. "Mounting facilities make it convenient to locate them anywhere; on the floor, wall, ceiling or up in the trusses," said a fifth. And, "With no parts to wear out, these capacitors should give years of reliable service."

So it went! And, as a result, it may be concluded that these many favorable comments testify to the fact that capacitors can solve many distribution problems—when planning, selection, installation and operation conform to manufacturers' recommendations and intelligent engineering design standards.



Now a new standard of safety in low-voltage switchgear

Test position with doors closed

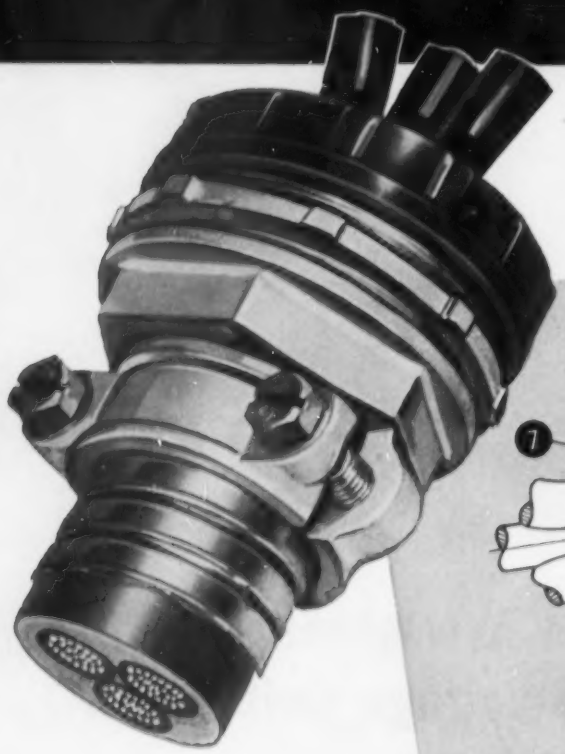
This exclusive I-T-E low voltage switchgear feature establishes a new standard of safety in testing circuit breakers. It offers the additional advantages of reduced handling; less maintenance; convenient "tagging out"; better dust protection; easier circuit identification. And all are yours at no increase in cost in the compact, modern design of I-T-E low-voltage switchgear.

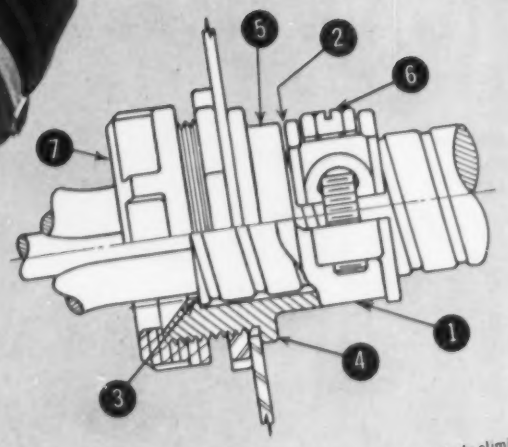
For complete information, contact your nearest I-T-E sales office. Or write for Bulletin 6004B. I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa.

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O.Z. TYPE "PK" is the clamp





1. Cadmium-plated malleable iron body and clamping cap for strength and corrosion resistance.
2. Armor clamped several turns from end.
3. Smooth armor stop assures termination at proper point—protects cable insulation from sharp, rough edges.
4. Flange on body eliminates locknut outside of cabinet.
5. Large hex facilitates installation.
6. Slotted hex-head clamping bolts can be tightened by wrench or screwdriver.
7. Strong O.Z. Type A hi-impact phenolic insulating bushing.

Here is a clamp designed specifically to meet the requirements of interlocked armor cable applications. The O.Z. Type "PK" Clamp provides exceptional speed and ease of installation, whether your cable enters the cabinet from the top, bottom or side. It is designed with ample thread length for use with all standard conduit fittings and terminators from 1" to 5" and is available for interlocked armor cable ranging in size from .99" to 4.38" O.D.

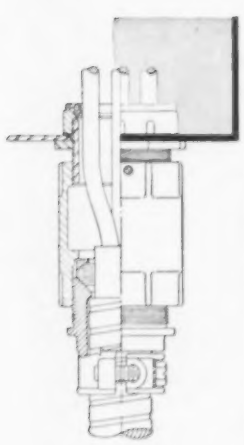
Call your local O.Z. Distributor.



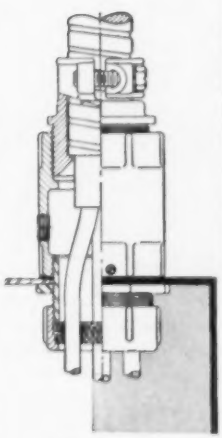
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combines with standard O.Z. fittings for any terminating or splicing job involving INTERLOCKED ARMOR CABLE.

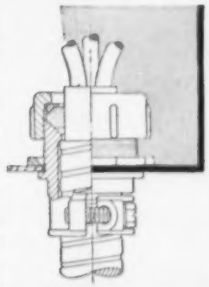
Seals cable ends to protect insulation against moisture and other contaminators—can also be used with threaded hubs and bosses to provide watertight cable entrances.



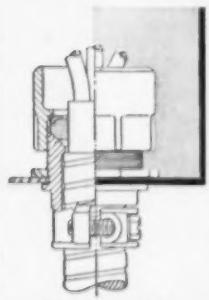
TYPE "PKC"
Terminator for interlocked armor cable entering bottom of cabinet.



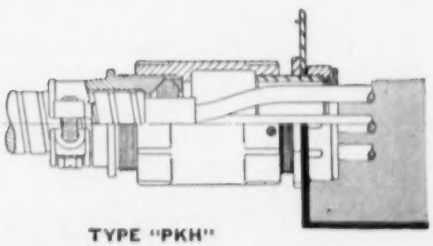
TYPE "PKT"
Terminator for interlocked armor cable entering top of cabinet.



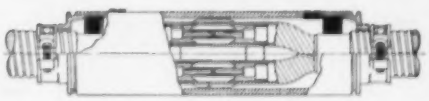
TYPE "PKG"
Sealing bushing for interlocked armor cable entering a cabinet.



TYPE "PKF"
Compound bushing for interlocked armor cable entering bottom of cabinet.



TYPE "PKH"
Terminator for interlocked armor cable entering side of cabinet.



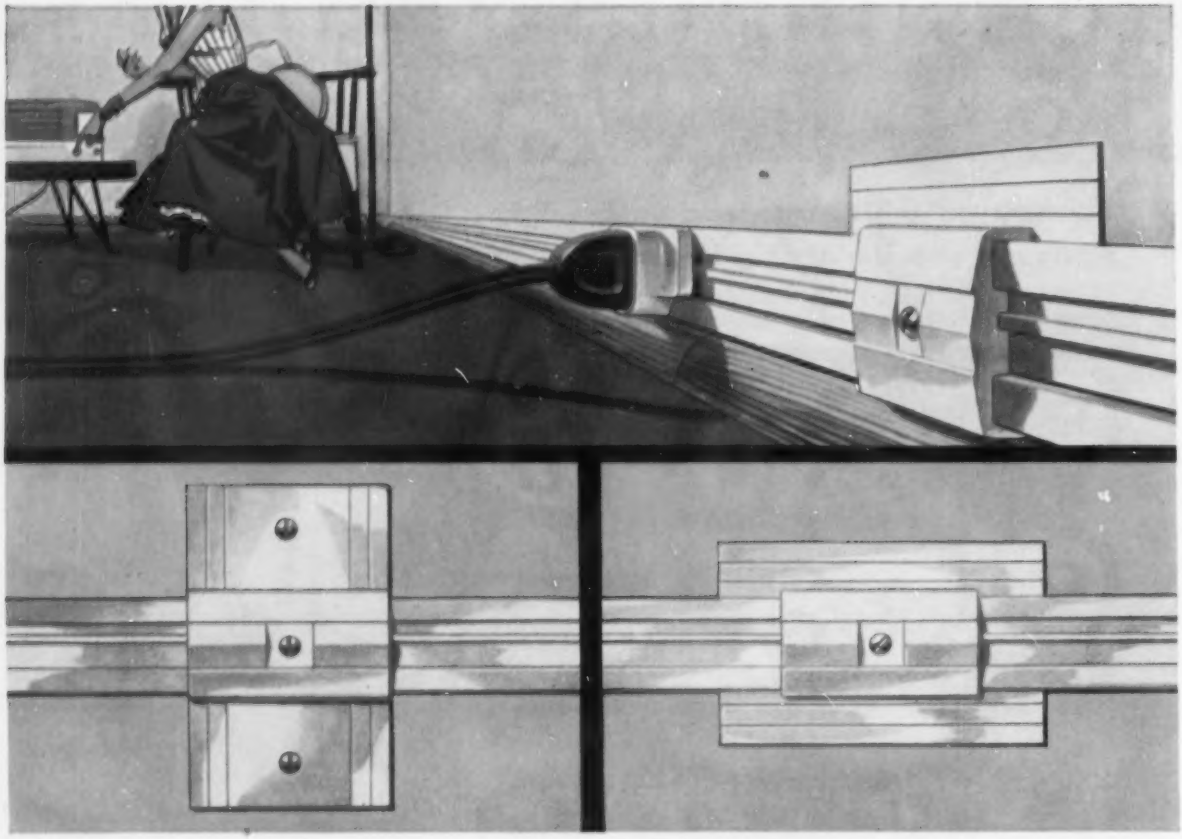
TYPE "PKS-J"
Splicing chamber for interlocked armor cable.

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feed-in device speeds up installation



The new feed-in mounts horizontally or vertically over any fixed outlet. It's neat, attractive . . . mounts flush. If used as an end feed, rubber plug closes the unused end. Listed by U.L.

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. . . fits any fixed outlet!

BullDog's new feed-in assembly fits over *any* existing wall outlet—easily, quickly. Merely remove the plate from the old outlet, connect the feed-in wires and screw the assembly to the outlet box. It's that simple! From the feed-in, Electrostrip mounts in horizontal runs . . . brings multiple, movable electric outlets to *any* home, hotel or building—without rewiring or plastering. It's ideal for new construction, too.

Stock and install Electrostrip. It is sold through BullDog distributors only to electrical contractors. See your distributor or write BullDog Electric Products Company, Detroit 32, Michigan. ©BEPCO

IF IT'S NEW . . . IF IT'S DIFFERENT . . . IF IT'S BETTER . . . IT'S

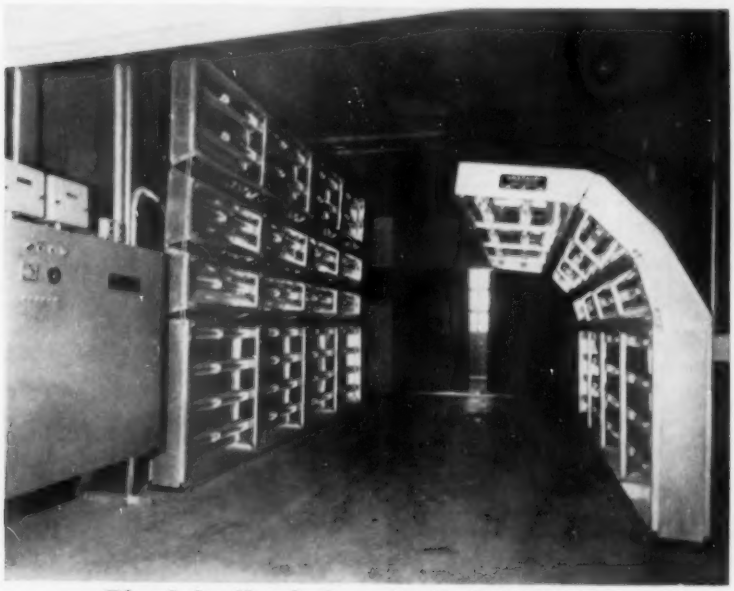
BULLDOG

ELECTRIC PRODUCTS COMPANY

A Division of I-T-E Circuit Breaker Company

Export Division: 13 East 40th Street, New York 16, N. Y. • *In Canada:* BullDog Electric Products Co. (Canada) Ltd., 80 Clayson Road, Toronto 15, Ont.

Practical Methods



Electric Heat Speeds Paint Drying

PRODUCTION

Time savings of seven and one-half hours in the drying of automotive bodies have resulted from the installation of a new drying oven at Summerfield Chevrolet Company, Flint, Mich. Under concentrated far-infrared radiation freshly-painted vehicles are now dried in only 30 minutes, an operation that formerly took as long as eight hours in dust-free atmosphere. This saving in time has increased the productive capacity of the paint shop. It has also freed valuable space, formerly required for storing vehicles during the air-drying and curing operations, for other types of collision and mechanical repairs. The company does a great deal of repair work, and the paint shop will paint a larger majority of Summerfield's used cars and trucks, as well as two-toning old and new cars to customer preferences. The stepped-up drying operation has paid rich dividends in the form of convenience and cost savings.

Painting of car and truck bodies in the shop is accomplished by a drive-through series of operations, similar to the assembly lines in nearby automobile factories. Following application of paint in the shop spray booth, the vehicle is moved directly down the line to the drying oven. Once inside, batteries of radiant heaters train intense drying rays evenly on all parts of the painted surface. Thirty minutes later, the vehicle is moved onto the wash rack for a cold-water spray which hardens the dried paint.

Key factor in this accelerated painting service is the type of heating unit in the drying oven. Sixty-four, 1500-watt, Chromalox electric radiant heaters are set in tiers in the panels of both oven walls. Automatic controls regulate the output of the heating elements and the inclination of the panels of the oven walls. Each of the two oven walls has three panels: vertical bottom, inclined center and top horizontal. For passenger cars and small panel trucks, the inclined center and top horizontal panels can be lowered into a tunnel shape for drying coverage of the entire vehicle. The oven walls are adjustable to vertical, upright positions for the larger trucks and trailers. Each wall can be regulated independently of the other. Zone control of the heaters in each panel permits spot drying of vehicles, with only one heating zone in use.

The radiation source in each of the 64 heaters is an alloy-sheathed tubular heating element. Sturdy all-metal construction renders the element damage-proof to bumps, splashed liquids and vibration, and other damage. The heaters produce an orange-red glow, no glare. An aluminum reflector is fitted into the parabolic housing of each heater. Heat from the element is focused in essentially parallel rays by the highly polished reflector. The result is a uniform band of heat, which eliminates hot spots on the vehicle surface.

The trend towards two-toning for auto exteriors is taken in stride by the radiant heaters. The radiator is in the invisible far-infrared portion of the spectrum, making the heaters "color blind." Because far-infrared wave lengths are longer, they are absorbed almost equally fast by all colors from white to black. Drying time is also shortened by the high-intensity radiation and quick warm-up of the heaters. Up to 1.84 kw per sq ft input of far-infrared radiation can be delivered, quickly achieving the desired temperatures. Where different work temperatures are needed, the radiant output stabilizes within minutes at the selected heat level.

The drying oven is equipped with Chromalox VCF-151 input controlers. Far-infrared energy can be varied from zero to 100% of rated power by a simple adjustment of the dial. The 30-minute drying time at Summerfield was obtained with the controller set at 40% of heat capacity. The drying oven was designed and fabricated by Swenson and Associates, Detroit, Mich.

Simple Record Card Gives All Job Facts

MANAGEMENT

Accurate records are an important asset to any type of business enterprise, be it large or small. And an electrical contracting operation is no exception. Without adequate records, it is difficult for a contractor to follow specific job progress; to catch excessive cost trends before it is too late; to determine inventory depletion; to balance expenses against income; to know just where he stands profitwise from month to month.

Too often, an inherent dislike of paperwork leaves the contractor completely in the dark until his auditor comes. Only after the trial balance is run does he know if he is just keeping his head above water, making a reasonable return

OUTLET BOXES & COVERS are our BUSINESS!

ARROW CONDUIT & FITTINGS CORP.

It is also our business to keep daily pace with the contractor's complex wiring problems. The result is our modern line, geared to your current needs. For example:

Specify
Arrow **TILE COVERS**



for Tile, Cinder Block and Wood Panel Partitions

For 4" and 4-11/16" Sq. Boxes

Cat. No. 4-SC81

In modern building methods, Arrow Tile Covers are ideal for brick, tile and cinder block construction. They are widely regarded as the most practical and economical devices for electrical installations.

Available in standard 1½" and 2" raised sizes for 1 and 2 devices. Also raised sizes from ¼" to 1¼".

Depend on all Arrow products for premium quality; for greater time and cost economies. Specify "Arrow Conduit" in your next job order.



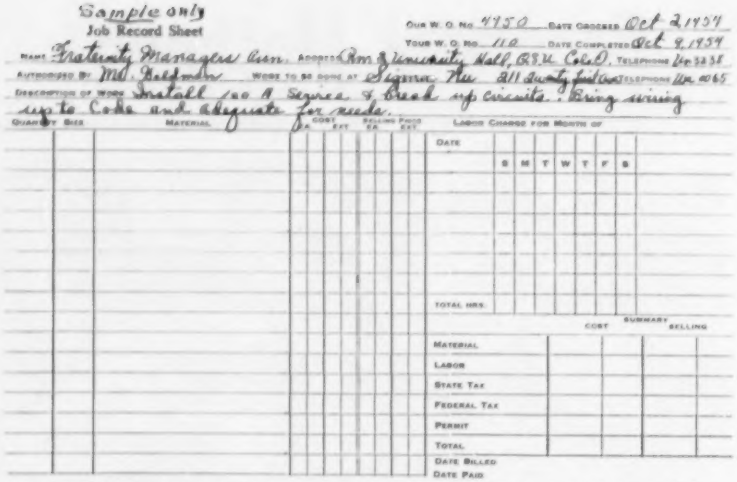
FREE!

WALL CHART — Box guide for maximum number of conductors. Quickly identifies boxes & covers.

ASK FOR NEW CATALOG, TOO. WRITE FOR BOTH, TODAY!

ARROW CONDUIT & FITTINGS CORP.
129 30th STREET BROOKLYN 32 N. Y.

Sales Representatives & *Warehouse Stocks
BALTIMORE, MD. • CHARLOTTE, N.C. • *CHICAGO, ILL. • *CINCINNATI, OHIO • *DENVER, COLO. • DALLAS, TEX. • *LOS ANGELES, CALIF. • *MIAMI, FLA. • NEW YORK, N.Y. • NEWTON CENTRE, MASS. • *PHILADELPHIA, PA. • ROCHESTER, N.Y.



Sample only
Job Record Sheet

Our W. O. No. 4750 Date Ordered Oct. 2, 1954
Your W. O. No. 110 Date Completed Oct. 9, 1954
Name Fraternity Managers Assn. Address Am. University Hall, 8th & Colo. Telephone Di 3838
Authorized By Mr. Goldsmith Work to be done at Sigma Nu 211 County Line Telephone Wa 4065
Description of work Install 100 A Square D Break up circuits. Bring wiring up to Code and adequate for needs.

Quantity | Size | Material | Cost Ea. | Cost Ext. | Selling Price Ea. | Selling Price Ext.

Labor Charge for Month of
Date | S | M | T | W | T | F | S
Total Hrs.

Summary | Cost | Selling
Material
Labor
State Tax
Federal Tax
Permit
Total
Date Billed
Date Paid

JOB RECORD CARD simplifies daily entry of labor and material expended on specific work order; has totalizing columns for billing and payment record; provides convenient check on job status. Data also can be used for estimating work of similar nature.

on his investment, or going into the red. Fortunately, however, a majority of contractors maintain sufficient records to keep them posted on day-to-day operations. Complexity or simplicity of record systems depend, to a considerable extent, upon the individual contractor and his approach to the problem. Details vary with the amount and type of information desired. The general trend is to keep records as simple as possible, yet give the necessary pertinent facts.

Such a system is used by the Hedrick Electric Company in Columbus, Ohio. It includes a simple, yet comprehensive job record sheet. The 9-in. by 6-in. card is easy to file and contains: complete job identification data; customer and job order numbers; description of work; completion date; itemized material list with cost and selling price columns; labor charge record; totalizing columns (both cost and selling price) for material, labor, taxes, and permit fees. Notations of billing and payment dates are also on the face of the card. The back of the card contains a continuation of the material list, plus payment records. Makeup of the card is such that it could be used for either contract, time and material or small job work.

Hedrick mechanics always carry a mail board and tablet. They keep track of their own time on each job (interval between arrival and departure) and also list all materials used on individual jobs. These are turned in at the office at the end of each work day. Spot checks by management determine general accuracy of these daily reports.

Every morning, each mechanic's time is first entered in his payroll book for pay reference. This time is also entered on the proper Job Record card described above. Materials used on each job are also listed on the cards. These daily entries keep management abreast of individual job progress. With very little time involved, a summary can be run to determine how much labor and material has been expended on any one job or on all unfinished jobs.

This method of recording job data has been very successful, Mrs. Esther P. Hedrick reports. In addition to presenting a daily picture of job status, it has proved exceptionally helpful when estimating other work of similar nature. And the Hedrick auditor adds his appreciation for a record system that makes his work easier.

Fluorescent Strips Dress Up Sidewalk Bridge

LIGHTING

Modernization of a 16-story office building on New York City's Madison Ave. entailed erection of a new stainless steel facade, installation of air conditioning throughout, and complete refurbishing of the interior. In spite of the magnitude of this operation, street level shops on three sides of the building were to remain open for business while the work was going on.

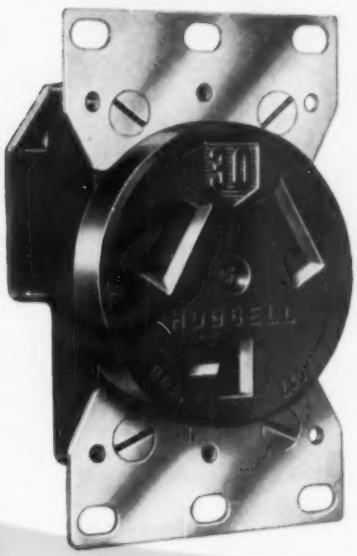
Collins Tuttle & Co., managers of the building, realized that pedestrian traffic might be substantially reduced and shop sales seriously af-

Fits Smallest Single-gang Box without Jamming, Squeezing or Scraping

IT PAYS TO HAVE HUBBELL GOOD CONNECTIONS

NEW SHALLOW DESIGN

POWER OUTLET



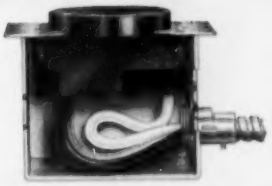
Measuring only 1.296" from mounting plate to base, this compact, new surface-type unit fits a minimum size, single-gang box without touching the sides. Ample space is allowed at the bottom of the box for lead-in wires. Hubbell's exclusive *pressure plate back wiring* further speeds and simplifies installation and insures utmost wiring security.

CAT. NO. 9350 30 Amp., 250 Volts. Grounded and Ungrounded.

Outstanding Design Features

- **Shallow, compact, rugged . . . fits minimum size box.**
- **Pressure plate back wiring simplifies installation.**
- **Terminals completely recessed for complete safety.**
- **Captive binding screws can't contact sides of box.**
- **Terminals cadmium plated to permit use of aluminum building wire.**
- **Tough fibre shield protects terminals.**
- **3-hole mounting plate permits mounting flexibility.**

More Space for Bulky Wires



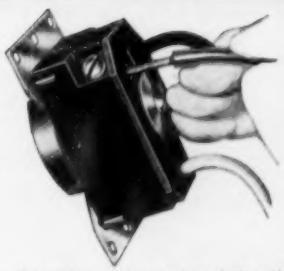
Extra space at bottom of box eliminates necessity of crowding or jamming wires and contributes to a safer installation.

Terminal Screws Can't Contact Sides of Box



Terminal screw heads are held captive to terminal plate . . . can't "back off" and touch sides of box.

Pressure Plate Back Wiring



Combines the speed and simplicity of back wiring with the security of a screwed terminal connection.

Harvey Hubbell, INC.

Dept. C-1 Bridgeport, Conn.

FACTORY WAREHOUSE LOCATIONS ASSURE NATIONWIDE STOCK AVAILABILITY

State and Bostwick Sts., Bridgeport 2, Conn. | 37 South Sangamon St., Chicago 7, Ill. | 103 North Santa Fe Ave., Los Angeles 13, Calif. | 1675 Hudson Ave., San Francisco, Calif. | 1111 Dragon St., Dallas 7, Texas

RAWL-ANCHORS TAKE 2000 POUND BLOWS ALL DAY LONG FOR OVER A YEAR!



THE CUSTOMER SAYS:

"The Chas. A. Burton, Inc., who re-modernized our loading dock, used Rawl products and they have proven very satisfactory under severe holding conditions."

THE CONTRACTOR SAYS:

"We like Rawl products! But, that is not all—we like the engineering help you have given us in solving the tough jobs.

To be specific—on the Neal Properties job at 9800 Detroit Avenue, Cleveland, Ohio, we had the job of fastening some 12" x 12" wooden bumpers into a common brick wall in front of four unloading doors in an existing building. We figured the bumpers would receive at least a 2000 pound blow every time a truck backed into them, and therefore they had to be be securely anchored.

We asked you for your recommendations on how to fasten these bumpers. You suggested one method which we followed and it worked "beautifully"; and after one year still is showing no signs of loosening up. It was one of those "headache" jobs and your help was invaluable. The solution—we cut a 1¼" hole 4½" deep into the brick work with a 1¼" carbide drill. Then we inserted a ¾" x 16" machine bolt with the head end into the hole. Over this we slipped two ¾" rawl anchors on the bolt and caulked them into the hole by using a piece of 1" steel pipe 24" long. Using two rawl anchors in tandem does the trick. They really hold. Recently a truck caught on the angle iron protecting the top edge of the wooden bumper and pulled the angle iron off, but the rawl anchors holding the wooden bumper held on and didn't budge."

Write for Catalog, prices and free Dimensional Chart.



THE RAWLPLUG Co., Inc.
271 Church St., New York 13, N. Y.



CONTINUOUS ROWS of one-lamp slimline luminaires under sidewalk bridge create an eyecatching effect that helps maintain a heavy flow of pedestrian traffic past street-level shops while upper stories are modernized, inside and out. Fixtures are provided with plastic diffusers and wiring channels for circuit distribution.

fected if the required sidewalk bridge had the drab and dimly lighted appearance typical of such structures. This potential detraction was turned into a positive selling aid by imaginative design and judicious application of modern lighting equipment.

The corrugated steel covering of the bridge was set at about 12 ft above the sidewalk — somewhat higher than the usual practice—to permit full visibility of the show windows and to take advantage of light spillage from the show windows in illuminating the sidewalk area. Bright yellow paint on the ceiling of the bridge also helped to dispel gloom and to create the atmosphere of a stylish commercial arcade. This tone was further developed by large ornate signs over bridge entrances, naming it as "The Promenade".

The most essential contributor to this effect, however, was the lighting system of fluorescent luminaires extending in two continuous rows around the three sides of the building. These units are 430-ma, 48-in. one-lamp slimlines enclosed in a Styrene plastic diffuser. Since the need for the bridge was to be ended before the advent of cold weather, standard, nonweatherproof units were considered adequate to job requirements.

Structural members of the bridge which supported the corrugated steel covering were spaced at distances too great to afford the re-



GRATELITE...
a jewel of sight-saving diffusion power

Thousands of these cubes make up each GrateLite panel... and create a brand new kind of light.



GUTH GRATELITE* LUMINOUS-LOUVERALL CEILINGS

FINE DIFFUSION... the cubicles appear to blend into one solid, luminous mass. Its surface is 30% vertical members!

HIGH EFFICIENCY... translucency and openness, tapered vanes, shallowness (3/8") — these assure highest illumination values with low absorption factor.

LOW BRIGHTNESS ... its vanes with contrasting cubicles and "in shadow" characteristics render light of extremely low brightness without an effect of dimness.

EXCELLENT SHIELDING ... exclusive 45° x 45° shielding method (with 3/8" cubes) gives greater eye protection than any other louver with larger openings.

LOW MAINTENANCE ... GrateLite *stays* clean — bugs and dust drop right through. Quick, easy washing restores brand new luster every time. A two minute job!

AND MORE! GrateLite's closely spaced vanes make it rugged to stand severe usage. It provides efficient AIR CONDITIONING DIFFUSION... and filters out a portion of room noise.

It's all in the sight-saving cubes — and only GrateLite has them!

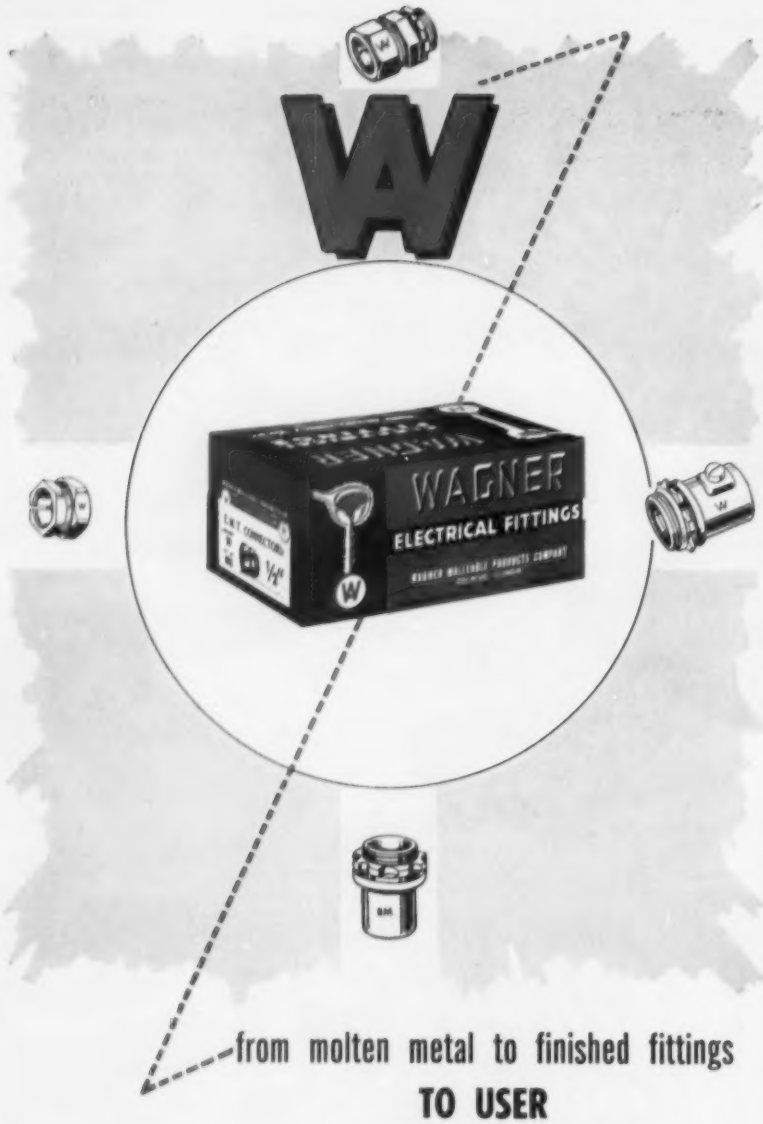
Write for free booklet "The GrateLite Story" today.

Guth

THE EDWIN F. GUTH COMPANY ST. LOUIS 3, MO.

Leaders in Lighting since 1902

*TM Reg. U. S. & Can. Pats. Pend.



from molten metal to finished fittings
TO USER

Satisfaction

• Here is the complete line of E.M.T. fittings —all styles—Compression Type, Set Screw Type—and BM Indenter Type.

Wagner MALLEABLE PRODUCTS CO.

Gen. Sales Office: 222 W. Adams St., Chicago 6, Illinois
Foundry and Plant: Decatur 60, Illinois

quired number of hanging points for the slimline fixtures. The electrical contractors, Consolidated Electric Construction Co., Inc., overcame this difficulty by arranging with Chesebro-Whitman Co., who supplied the bridge, to have auxiliary wooden beams placed in the bridge framework for this purpose.

Power for the lighting system was, of course, taken from the house distribution and controlled from a temporary panel in a street level management office. Circuits were carried in the fixture wiring channels and arranged so a single unit would remain lighted for each 25 linear feet of the walk during the early morning hours when the rest of the system was shut off. The installation was kept lighted from the beginning of the business day until midnight.

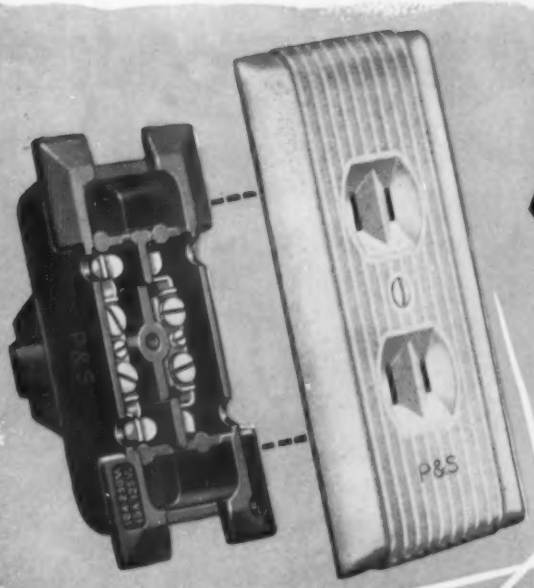
Both owners and management found The Promenade a most successful venture in building good will with its street level tenants and in developing general awareness of and interest in their newly modernized property.



Advance Storage Cuts Down Delivery Delays

Equipment storage for pending jobs is being provided by the Tennessee Armature and Electric Co. on the top floor of its 3-story building in Knoxville, Tenn. To prevent last-minute delivery delays and subsequent work stoppage, equipment is ordered well in advance for contracted jobs and placed in storage, one bay being designated for each job. A ceiling hoist has been provided to enable large equipment to be hoisted up through the floor from trucks driven up an interior concrete ramp and parked on the second floor.

When construction on a particular job begins, all material for the job can be loaded onto trucks from one spot without the usual sorting and checking from stock.



MAKES REMODELING JOBS PROFITABLE

...INSTALL P&S 500 DUPLEX OUTLETS

the only self-contained outlet designed exclusively for contractor use.

P&S 500 Duplex Outlets are custom-made for **existing installations** that call for additional outlets . . . and they can be placed **exactly** where the customer wants them.

These Features Make P&S 500 Outlets The Best

- √ Self-contained — no box required
- √ No Soldering or Taping
- √ Any Wall Surface Can Be Used
- √ Quick, Easy, Profitable Installation
- √ Dependable Double-Grip Type Outlet
- √ Modern Design
- √ Available in Brown or Ivory
- √ For Use With Non-Metallic Cable
- √ Underwriters' Laboratories Approved

Write today for the complete story on the P&S 500 Outlet. Just drop a card to Dept. ECM-11.

P&S 500 Outlet Makes Installation Faster . . . Easier



Cut cover of box along perforated line and use cover to scribe outline of wall opening.



Thread cable through knockout holes in back of outlet and tighten metal clamp against cable.



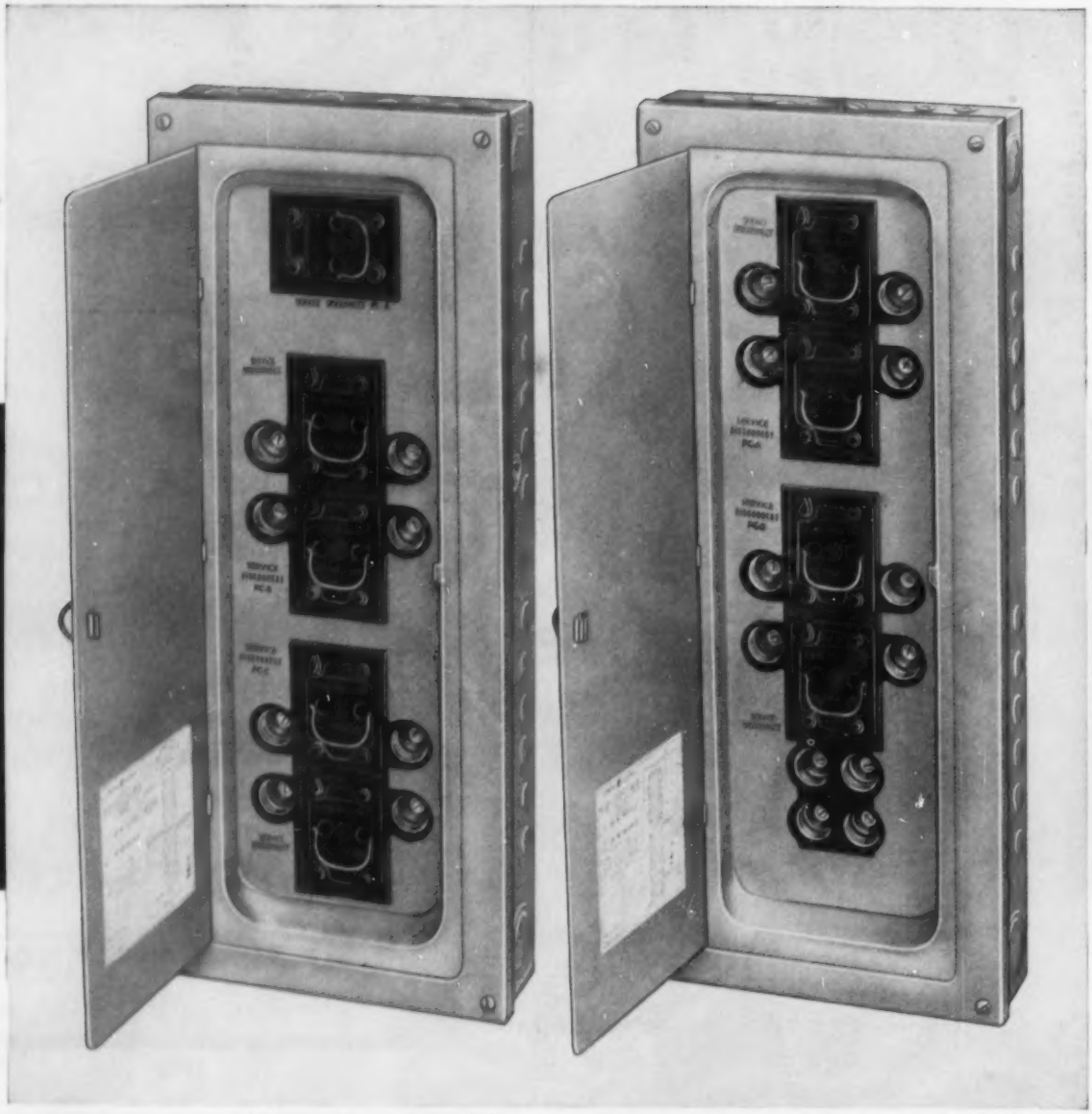
Hold clip straps in position and press outlet body into wall recess.



Assemble wall plate as indicated.

P&S PASS & SEYMOUR, INC.
SYRACUSE 9, NEW YORK
71 Murray St., New York 7, N.Y. 1229 W. Washington Blvd., Chicago 7, Ill.
In Canada: Renfrew Elec. & Refrig. Co., Ltd., Renfrew, Ontario

Two new fuse pullers added



Five 240-volt pullers on this new 100 amp, parallel-connected fuse panel are: 60 amp lights and appliances, 60 amp range, one 30 amp independent sealable and two 30 amp wired-in branch pullers. This new fuse panel, available for flush or surface mounting, has eight plug fuse branch circuits. Catalog number TC221119-8.

Four 240-volt pullers with either eight or twelve plug fuse branch circuits are available on General Electric's new 100 amp parallel-connected fuse panel: 60 amp lights and appliances, 60 amp range, and two wired-in branch pullers of 30 amps each. Catalog numbers TW22119-8, -12. Available for flush or surface mounting.

Progress Is Our Most Important Product

GENERAL ELECTRIC

to General Electric line

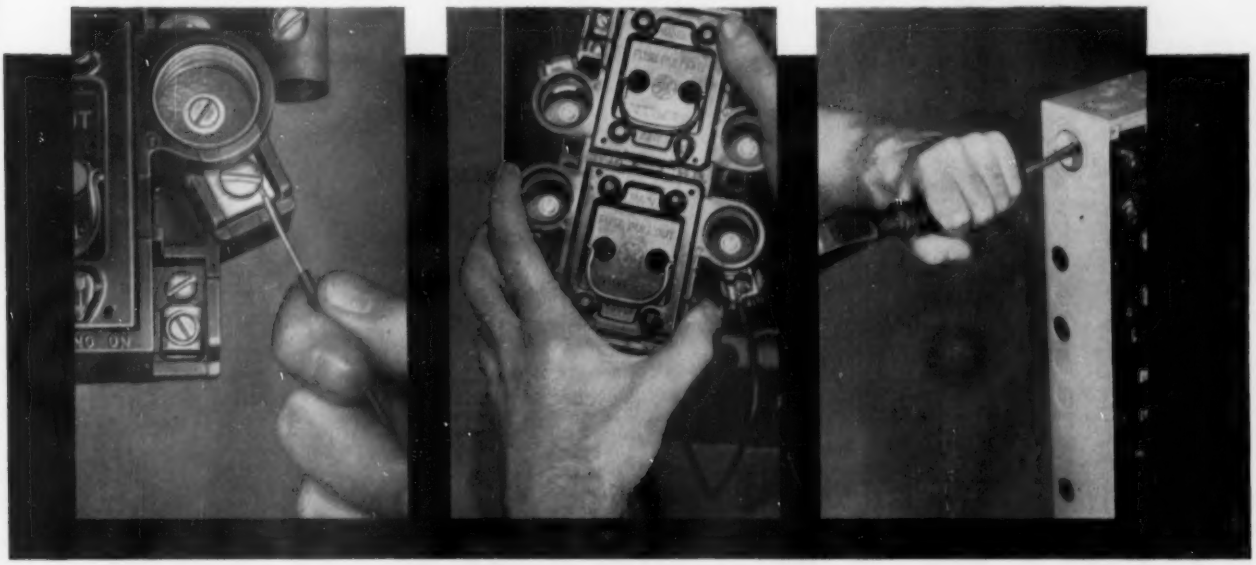
Feature 7 quality extras, including straight-in wiring, slide-out interiors, and easily removed knockouts.

Here are two new General Electric fuse panels for installations that require three or more 240-volt circuits. They round out General Electric's wide selection of service entrance equipment. Available in combinations of main, range, branch and independent sealable pullers, these new fuse panels give you full flexibility for 100 amp installations. They feature General Electric's famous 7 quality extras—built in at no extra cost to you. These quality extras by General Electric mean easy installations, assure dependable service.

Straight-in wiring helps you make quick terminal connections without looping wire ends around screws. Just insert wire and tighten.

Exclusive slide-out interior provides plenty of working room. Fast, too. Slides in and out quickly without screws and tools to fumble with.

Plenty of easily removed knockouts, located so cable can enter box at most convenient place, make installations easy, save on wiring.



Here are four more quality extras G. E. gives you at no extra cost:

- **Narrow, shallow box construction makes flush mountings easier.**
- **Snap-action fuse pullers prevent partial contacts.**
- **Current-carrying parts silver-plated for cool operation.**
- **Bonderite* finish resists corrosion.**



General Electric has a complete 100 amp line of series and parallel fuse pullers. They satisfy the capacity requirements of all types of installations with various combinations of 240-volt and 120-volt circuits including independent sealable pullers.

General Electric also offers circuit breaker load centers with up to 20 circuits. And for economical installations, G. E. has both 16 and 20 circuit split-bus designs and a 12 circuit load center with 100 amp main circuit breaker wired in.

For more information see your G. E. Trumbull distributor or write Trumbull Components Department, General Electric Company, 41 Woodford Avenue, Plainville, Connecticut.

**Parker Rust Proof Company*

Motor Shops

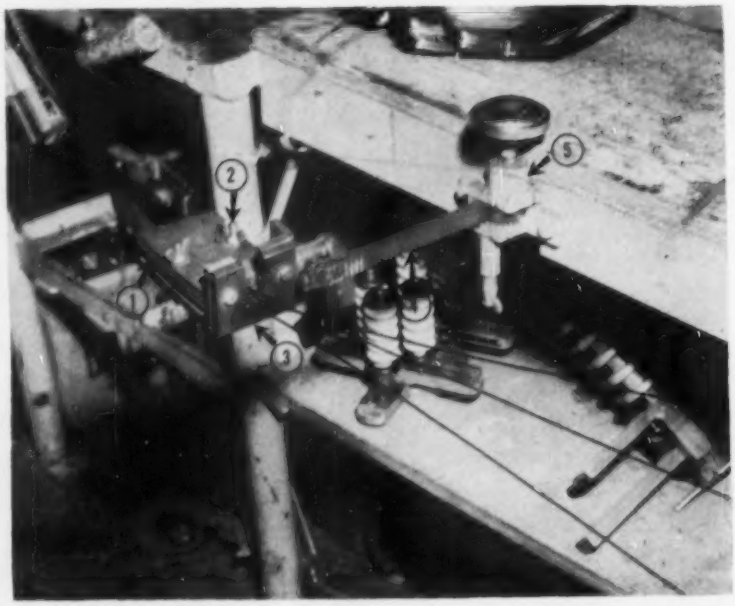
Geared Arm Aligns Wire Tension Device

To mechanics in the average motor repair shop, winding coils for rewound motors is a fairly exacting chore. The mechanic must watch the winding head, check the counter for number of turns, maintain proper tension on the magnet wire and guide the wire into the grooves, slots or "spools" of the coil form. Remove one or more of these attention-demanding operations and the mechanic will be able to concentrate on the winding head. The net result will be a noticeable spurt in his efficiency.

That was essentially the analysis made of this important shop activity by G. O. Toms, enterprising motor shop operator at Spokane, Wash. His efforts to focus mechanic attention primarily on the coil winding head led to the development of a combination adjustable tension block and wire guide. Once the device is set to proper tension, the coil winder can watch the counter on the winding machine and move the magnet wire from one slot to another by merely turning his wrist.

Toms' tension block is free to move in a 360-degree vertical arc; is attached to a bench-mounted steel arm providing some 14 in. of lateral movement for aligning wire with the winding head. The arm is made of ⅝-in. square steel stock; has teeth on one side to form a "rack"; is supported by a bracket housing a pinion gear with hand knob. Turning the knob moves the arm and tension block in and out as desired. Once set, the arm is held in position by a friction device on the underside of the bench bracket. A thumb screw in a collar presses on a coil spring which forces a fiber block against the underside of the adjustable arm.

The tension block itself is a simple assembly of multiple layers of sheet fiber between which the magnet wires pass. The fiber sheets are mounted to a base block consisting of a 2¾-in. length of 4-in. steel angle cut down to 2-in. height on one side. The long side forms the horizontal portion of the block and has two metal ridges welded along its 2¾-in. face to "seat" the fiber



WIRE TENSION BLOCK and guide consists of layers of sheet fiber (1) under tension of thumb screws (2) pressing against wires passing through slot in protective fiber block (3). Device rotates on toothed-arm (4) which is moved in or out by hand-knob pinion gear (5). Lateral arm movement is 14 in.



MECHANIC CAN concentrate on winding head and turn-counter while winding coils. His right hand turns knob moving tension block to feed magnet wire onto coil form slots or grooves.

for full operating efficiency

choose a Century MOTOR

***Performance-Rated* to Bring Out All the Top Performance That's Engineered Into Your Equipment**



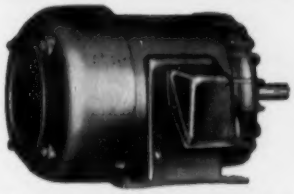
DRIP PROOF—1/20 to 3/4 H.P.
A.C., Single or Polyphase
Send for Bulletin 1-5P1



RIGID BASE, OPEN TYPE, PROTECTED
1 to 400 H.P.—A.C., Single or Polyphase
May be used in place of splash proof... screens available for rodent protection.
Send for Bulletin 6-1P1



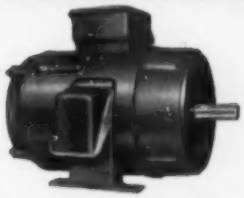
CUSHION BASE, OPEN TYPE, PROTECTED—1/20 to 5 H.P.
A.C., Single or Polyphase
Send for Bulletin 6-1P1



TOTALLY ENCLOSED FAN COOLED
1 to 100 H.P., A.C., Single or Polyphase
Send for Bulletin 6-1P1



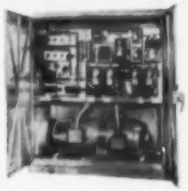
FLANGE BRACKET (NEMA "D")
Round, short frame—for horizontal or vertical operation
Send for Bulletin 6-1P1



FACE TYPE BRACKET (NEMA "C")
With feet for motor-mounted equipment
Send for Bulletin 6-1P1



EXPLOSION PROOF MOTORS
2 to 100 H.P.
UL approval Class I, "C" and "D"
Class II, "E," "F" and "G"
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SELECTIVE SPEED DRIVES
1 to 150 H.P.
Offering a Wide Range of Closely Controlled Speeds
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Century Performance-Rating means that you can select precisely the right motor size, speed, frame, mounting and torque characteristics to fit the needs of each installation.

Performance-Rated©
MOTORS
1/8 to 400 H. P.

Mail this coupon for FREE bulletins



GEAR MOTORS—1 to 125 H.P. (parallel)
1/8 to 3 H.P. (right angle or parallel)
A.C. or D.C., Speed to fit your need
Send for Bulletin 4-1P31

CENTURY ELECTRIC COMPANY

1806 Pine St., St. Louis 3, Mo. • *Offices and Stock Points in Principal Cities*

To CENTURY ELECTRIC COMPANY, 1806 Pine Street, St. Louis 3, Mo.

Please send me the following bulletins:

(fill in numbers here) .....

.....

.....

Name..... *Title*.....

Company.....

Address.....

City..... *Zone*..... *State*..... *CE-37*

NEW Blackhawk Service Entrance Head is



Built-in slip fitter

Just set the housing frame on the unthreaded conduit and tighten the set screws all in a jiffy.

No extra fittings to juggle

— nor to pay for! The ingeniously simple built-in slip-fitter eliminates extra clamping parts or a separate slip-fitter.

No thread cutting

Save valuable time and labor and use any rigid or thinwall conduit without threading. Service can be installed close to wall because head slips right on.



Patent Applied For.

Gain time and profits — eliminate thread-cutting and paying for separate slip-fitters and extra clamping parts. Now you can get Blackhawk's simple, neat, complete entrance head that attaches to both thinwall and rigid conduit by just tightening two set screws!

The housing frame is the slip fitter for the new Blackhawk Service Entrance Head, so there is no need to pay for — and fumble with — separate slip fitters and extra clamping parts. And it's neat — the set screws tighten directly on the conduit, so only the heads show.

The new, completely-protected Blackhawk aluminum Slip Fitter Service Entrance Head is available in all popular sizes.

Immediate delivery

Blackhawk Industries

BLACKHAWK INDUSTRIES
DUBUQUE, IOWA

Specify B-I for quality fittings, built to save you time



A TWIST OF THE WRIST on pinion hand-knob moves magnet wire tension block back or forth to guide wires into proper grooves of slots on the coil form.

sheets. Two wing-nut bolts, centered on the 4-in. dimension, hold four sheets of $\frac{1}{4}$-in. fiber, each $3\frac{3}{8}$-in. by $2\frac{3}{8}$-in. in size. As the wing nuts are tightened, the fiber sheets form a "bow" against the ridges and apply tension to the wires passing between.

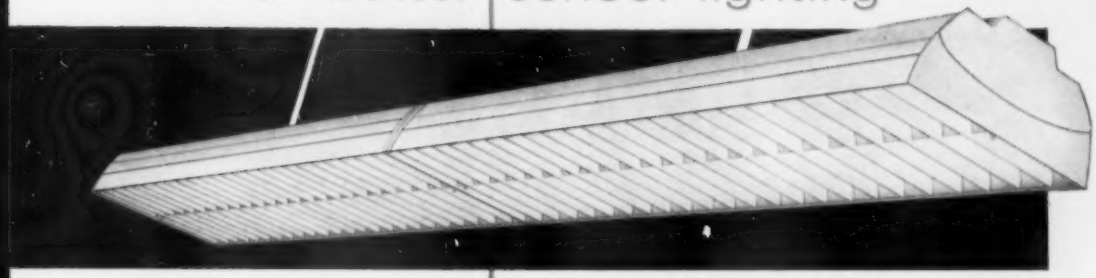
The short, vertical side of the block has a wide, deep slot through which the payed-out magnet wire converges before passing through the fiber sheets. This is backed up by a protective block of $\frac{3}{8}$-in. thick fiber with a slightly smaller slot. Wires rub against the fiber but do not touch the metal of the tension block. A shaft, welded to the block assembly, fits into a collar on the adjustable arm and is held in place by a cotter pin. Thus the tension block is free to move up and down as required by the revolving winding head or coil form.

Mechanics in the Toms shop find the quality and quantity of their coil production has increased since the addition of this tension block. More concentration on the winding head and counter and less bother with wire tension and alignment seems to have been the answer.

Brush-Spray Unit Cleans Small Motors

Small motor stators, rotors, bearings, end bells and accessory parts are being cleaned quickly and efficiently with a portable brush-spray unit at United Electric Motors in Seattle, Wash. The new equipment item replaces the solvent dip tank and paint brush method formerly used for this type of cleaning operation.

For better school lighting --





The Lexington in their lives

Education used to be largely a matter of hearing and reciting. Today's children, however, learn by *seeing* and *doing*. The visual techniques of modern teaching demand the very best in classroom lighting. Good lighting is essential—to protect young eyes at work, to make the learning process more efficient, to create an atmosphere of cheerful cooperation between teacher and student. This is why architects and school authorities across the country have chosen the Miller "Lexington" as the standard of quality for contemporary classroom lighting.

If you have a new school in the planning stage, let us help you with expert advice and detailed information on the lighting best fitted to your needs.

PARTICIPATING IN SCHOOLROOM PROGRESS, U.S.A.



miller

SINCE 1844

Better Lighting for a Brighter America

THE MILLER COMPANY: GENERAL OFFICES, MERIDEN, CONN.
FACTORIES: UTICA, OHIO—MERIDEN, CONNECTICUT.
IN CANADA: CURTIS LIGHTING OF CANADA LTD. TORONTO.

Better

REWIRE on the SURFACE

safe

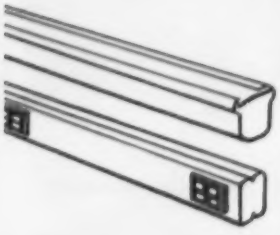
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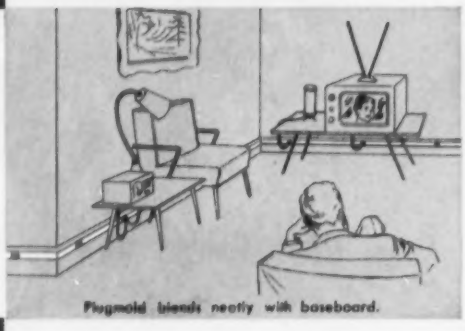
with

WIREMOLD

and

PLUGMOLD





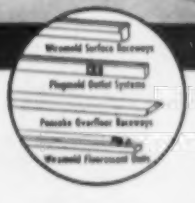
Plugmold blends neatly with baseboard.

Wiremold carries power to room air conditioners



Outlets for showroom spotlights and electrical appliances





The BEST WAY to wire MOST buildings

The ONLY WAY to wire MANY buildings

- You can take advantage of the big rewiring market by using Wiremold and Plugmold . . . the *modern* way to wire and rewire.
- You can *pre-plan* every wiring job and follow the plan *easier* with *pre-engineered* Wiremold and Plugmold.
- You can do *more jobs,* you can control installation costs and *make more profit* on *every* job with Wiremold and Plugmold.
- You can build and keep *more* customer satisfaction with Wiremold and Plugmold.
- Wiremold and Plugmold meet all wiring code requirements.

For further information Write Dept. E-2

The WIREMOLD Company

HARTFORD 10, CONNECTICUT



BRUSH-SPRAY cleaning of small motor parts is done with a small, self-contained unit with solvent recirculating system. Wash tank holds about three gallons of solvent. Dip tank at back is for soaking when needed.



SOLVENT FLOWS through hollow handle of brush with stiff nylon bristles to dislodge grease and dirt. Dirty solvent passes through screen filter under expanded metal rack in tray. Pump at back forces fluid back through brush.

Designed primarily for cleaning automobile carburetors, the self-contained unit combines in one small package a wash tray, soak tank, electric solvent pump and hollow-handled brush through which the solvent flows. Its small size and relatively light weight permit it to be placed on any workbench or suitable table and plugged into the nearest electric outlet.

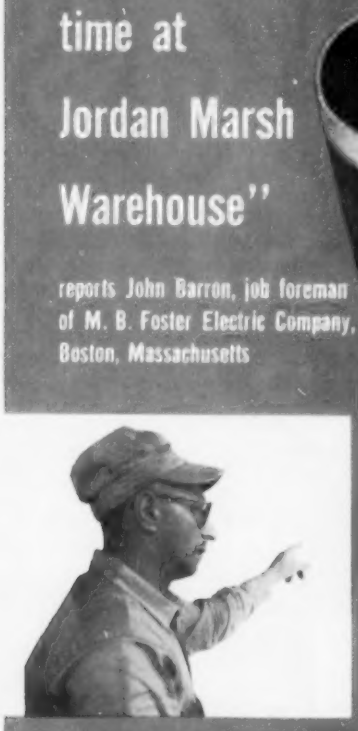
At the UEM shop, it rests on the drain board of an existing wash tank and is used exclusively for small parts and motors. The wash tray holds about three gallons of ordinary solvent which is recirculated, by the electric pump, through the hollow handle of a special brush with stiff nylon bristles. As the mechanic vigorously brushes the

"SPANG HD saved 25% on conduit-installation time at Jordan Marsh Warehouse"

reports John Barron, job foreman of M. B. Foster Electric Company, Boston, Massachusetts



Owner: Allied Stores, Incorporated, New York, N.Y.
Architect: David J. Griswold, Minneapolis, Minn.
Contractor: George B. H. Macomber, Builders, Boston, Mass.
Electrical Contractor: M. B. Foster Electric Co., Boston, Mass.
SPANG Distributor: Westinghouse Electric Supply Co., Boston.





The specs for the Jordan Marsh Company Warehouse at Auburndale, Mass., designed as a home-furnishing storage unit, called for a revolutionary surface conduit application. SPANG Heavy-Duty Hot-Dipped Galvanized Conduit was specified throughout the building. Here's why:

Mr. John Barron, job foreman and veteran of 38 years in the electrical field, reported: "When we look for quality in a conduit, our requirements are simple, yet exacting. We must have flexibility to permit bending and shaping without damage to the conduit. Labor is a major cost element in conduit installation, and anything which makes for a faster, easier-flowing production is money in the bank.

"There is a constant necessity of making up smaller, off-standard lengths which means cutting and rethreading of standard sections. We found that SPANG HD gives us the maximum of workability.

"The manner in which we receive the conduit can make a big difference in our production efficiency. . . . Nothing excels SPANG in this respect . . . all we have to do is remove the protective caps from the threads and make the installation. We know that they are clean and undamaged."

From the selection of *top-grade* skelp to the final testing and inspection of the finished conduit, SPANG Conduit is *quality-controlled*, resulting in easy bending, threading and cutting.

Cash in on SPANG'S *quality-control* benefits. See your nearby SPANG Distributor. He carries the complete SPANG Conduit line—SPANG HD, SPANG Black, SPANGLEAM EMT.

SPANG CONDUIT

SPANG-CHALFANT
Division of The National Supply Company
GENERAL SALES OFFICE:
TWO GATEWAY CENTER, PITTSBURGH, PA.
District Offices and Sales Representatives in Principal Cities



. . . new lightweight Greenlee Hydraulic Bender for 1/2"-2" conduit

easily portable . . . makes 90° bend with one ram stroke

"Because it is easy to handle and transport from job to job . . . because it will make a 90° radius bend with one thrust . . . and because of its thin-wall attachment obviating the need for buying manufactured bends, we selected the new GREENLEE No. 880 Bender," says C. E. Rose of Rose Electric Co.

And, since having this new *lightweight* GREENLEE Hydraulic Bender on the job, this company reports substantial savings of man-hours and complete elimination of conduit spoilage and need for manufactured bends.

You, too, will welcome the *easy portability* of this advanced type bender. One man can easily carry and operate it . . . make smooth, accurate bends in 1/2"-2" conduit or pipe in just a few minutes.



With light, but strong aluminum alloy used for many parts, weight of this new tool has been greatly reduced so that it can be carried by hand or simply pushed along on its pipe supports which serve as rollers.

Two-speed hydraulic hand pump with special speed coupling on the hose and pump means simplified handling, fast setup. And with its attachments for thin-wall conduit, tubing, and bus bar, the No. 880 Bender can make almost any type of bend *in all types of material* within its size range. *A complete 90° bend can be made with one ram stroke.*



Designed for easy hand operation, this new lightweight bender can also be teamed with a GREENLEE Power Pump for fast production jobs. Get the complete story now on this highly versatile new bender, see how it can be one of the best tool investments you've ever made! Write for folder E-217.

GREENLEE

GREENLEE TOOL CO., 1742 COLUMBIA AVE., ROCKFORD, ILLINOIS



AIR BLAST from compressed air line drys armature and small motor parts after they have been cleaned with spray-brush unit. New method saves time and solvent and substantially reduces amount of solvent mist in air.

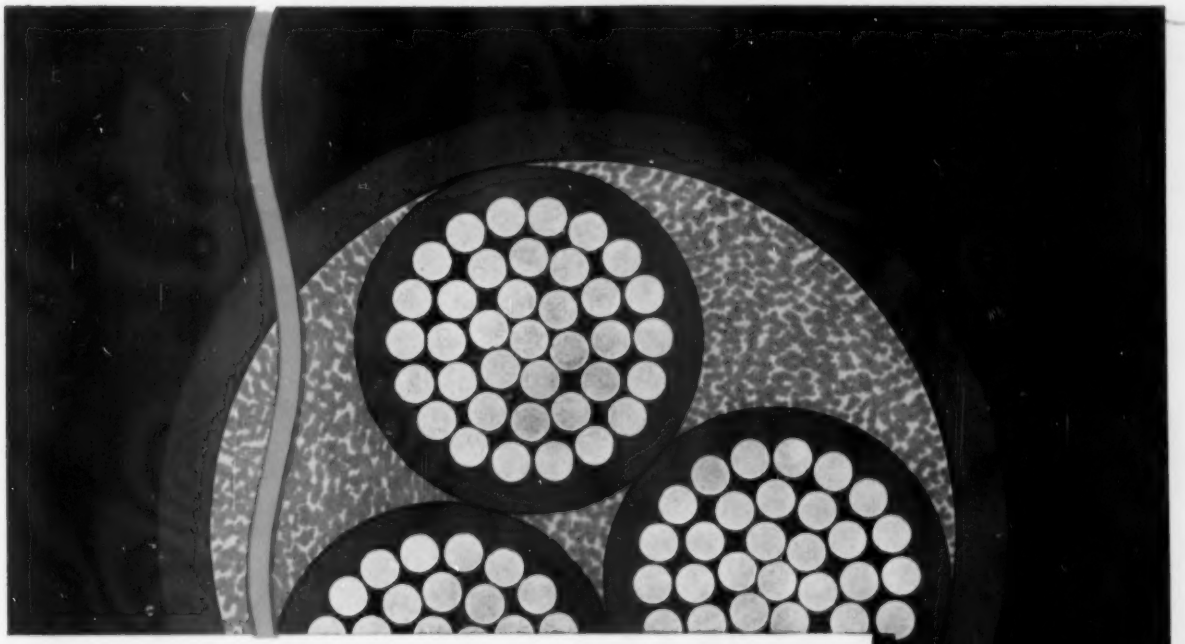
parts to dislodge grease and dirt, the solvent flows through the bristles and removes the residue.

Parts rest on an expanded-metal rack in the wash tray. Dirt-laden solvent passes through a screen filter under the rack. While this removes most of the dirt particles, an additional filtering action is provided by a strainer in the solvent pump as the fluid is recirculated to the brush. Where pre-soaking is necessary, parts are suspended or placed in the "soak tank" at the back of the unit. After cleaning, all parts are air-dried with a blast of compressed air at an adjacent bench.

Among the advantages listed by shop personnel are: light weight, portability, time economy, solvent economy and a marked reduction in amount of solvent mist in the air.



PORTABLE JIB CRANE is used to advantage in the motor repair shop of United Electric Motors, Seattle, Washington. Unit has a 500-pound capacity; an A-frame base that straddles motors and slips under benches; a hand-operated drum with steel cable to raise and lower hook. Adjustable telescopic center post has a see-saw boom at top controlled by heavy chain anchor. Pull bar on front wheel makes it easy to steer unit around shop with ceiling too low for conventional overhead cranes or hoists.



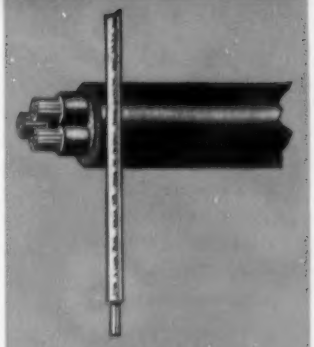
Paranite®—AND THE INVISIBLE INGREDIENT

● Electricians know the various types of wire and cable, of what they are made, and their proper application. But with Paranite products there is an "extra" that you cannot see . . . or feel . . . for Paranite is a perfectionist.

Paradoxically, "good enough" is *not* good enough at Paranite, for since the company was founded 66 years ago, it has been motivated by the desire to make a better product each day than the day before, if humanly possible. This became a habit, then a tradition, and today is the *invisible ingredient*.

Growing aware of the excellence of product that this "invisible ingredient" made possible, wholesalers and contractors coined a phrase decades ago expressing their confidence in Paranite: "If It's Paranite, It's Right." In the course of time, the company adopted this trade phrase as its slogan.

True in past years—more true today! The "invisible ingredient" still silently assures you that every foot of Paranite Wire and Cable is as nearly perfect as human hands can make it . . . utilizing modern equipment and cautious testing.



From POWER CABLE to FIXTURE WIRE . . . you'll find Paranite quality high . . . service outstanding!

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DIVISION ESSEX WIRE CORPORATION

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MANUFACTURING PLANTS: **Birmingham, Ala.; Anaheim, Calif.; Jonesboro, Ind.; Marion, Ind.**

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*Atlanta, Georgia; Boston, Massachusetts; *Chicago, Illinois; Cleveland, Ohio; Dallas, Texas; *Detroit, Michigan; Hartford, Connecticut; Indianapolis, Indiana; *Kansas City, Missouri; *Los Angeles, California; *Newark, New Jersey; Omaha, Nebraska; *Portland, Oregon; Upper Darby (Philadelphia), Pennsylvania; Rochester, New York; *Saint Louis, Missouri; *San Francisco, California; Seattle, Washington; Springfield, Illinois.

NOW

Borthig Offers

EPOXY

Insulating Varnishes

155°C 311°F



No. 3829

EPOXY

BAKING VARNISH

(Thermo Setting)

THE BORTHIG CHEMISTS have now produced an ELECTRICAL INSULATING VARNISH using the EPOXY RESINS.

NO. 3829 EPOXY BAKING VARNISH is a CLEAR THERMO SETTING BAKING VARNISH which requires no activator and cures entirely by heat induced polymerization. It fits into your present BAKING CYCLES.

NO. 3829 has good stability in the dip tank and the cured film offers 100% longer heat life than the better grade CLASS B phenolics (at 155°C.)

Laboratory tests show higher values for adhesion, wet and dry dielectric, bonding and corrosion resistance at higher temperatures.

It is recommended for those motors and transformers that are made to meet tough conditions of operation.

Detailed information available upon request, write us or contact a Borthig Agent.

Also

100% SOLID EPOXY COMPOUNDS for embedding electrical windings and AIR DRYING AND BAKING EPOXIES for surface applications

GEORGE C. BORTHIG CO., INC.

Insulating Varnishes

EAST RUTHERFORD 6, NEW JERSEY, Drawer 115

CROSS COUNTRY DIALING

[FROM PAGE 97]

starter to a lug to the motor casing.

Switchgear Control

Remote control of switchgear breakers was required from three locations—at the diesel control bay about 150 ft from the basement switchgear, on the second floor, and on the 6th floor about 100 ft from the switchgear. This was in addition to the control switches for local operation required at each switchgear location. The remote stations were to operate a total of 49 circuit breakers—37 in the basement and 12 on the 6th floor, including all installed, spare and future breakers (with the exception of the mains and ties).

Because of the complex routine set up for operating on the emergency power supply, direct control wiring from each control switch to its corresponding breaker circuits would have involved running 222 No. 12 wires from the basement switchgear and 72 No. 12 wires from the 6th floor switchgear to one control panel, plus 254 No. 12 wires between each of the three panels, with prohibitive conduit requirements.

Therefore, supervisory control equipment was chosen which provides a means of selective control over a single pair of wires from control station to outlying station by means of codes. In addition, continuous visual indication is provided for each supervised breaker to prevent operation due to control cable faults and to indicate automatic operation or change in position of the breakers.

In normal usage, the circuit to be controlled is selected by depressing an appropriate "select key". This causes a code to be transmitted to the outlying station which sets up the relays for the desired breaker. The outlying station then transmits the code for this breaker back to the control station. If both codes agree, an amber lamp will light, and it is safe to press the "trip" or "close" key. If the codes did not agree, it would indicate trouble, and the trip key would not be pressed.

The equipment in this installation consists of the three control stations and two outlying stations, one at each switchgear location.

Electrical contractor for the project was Buffalo Electric Co. of New York.

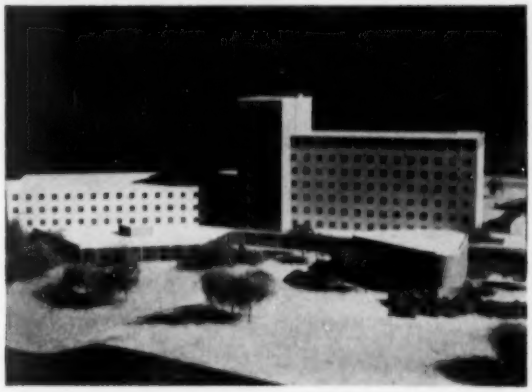
Jacksonville:
Architects—Kemp, Bunch & Jackson.
Fixtures—Westinghouse Electric Corp.





Minneapolis:
Architects—
Magney, Tusler & Setter.
Fixtures—
Garden City Plating & Mfg. Co.

Chicago:
Architects—
Naess & Murphy.
Fixtures—
Day-Brite Lighting Inc.



3 New Prudential buildings use Corning Pattern No. 70 Low-Brightness Lens Panels

Regionalized exteriors give these Prudential Insurance Company of America buildings a look of "belonging" in widely separated parts of the country.

Interiors, however, have one pleasing element of resemblance: illlumination. All use Corning Pattern No. 70 Low-Brightness Lens Panels. Prudential has used nearly 30 miles of this prismatic panel to light general work areas and executive areas with soft, glare-free, shadowless illumination. Desk-top illumination measures 40 to 45 foot-candles.

Cleaning the panels with a damp cloth will *keep* illumination high. Panels are troffer length, too. No seams to leak light or let in dust and insects. Panel sizes up to 34" x 100".

Prisms at work

Corning Pattern No. 70 Panels are made of crystal glass with a configuration of hexagonal prisms. Prisms intercept light trying to pass at glare-zone angles, bend it downward to useful zones. Light angled more vertically is spread evenly in the useful area.

You can use Corning Pattern No. 70 Low-Brightness Lens Panels wherever you want controlled surface brightness, lasting efficiency, attractive initial cost, absence of replacement due to aging, warping, surface deterioration. Wherever you use it, you can expect an enthusiastic reaction.

For detailed information, see Sweet's Catalog, or write to Corning for Bulletin L110B.



Note the excellent desk top illumination in this typical Prudential Insurance work area.

CORNING GLASS WORKS, CORNING, N. Y.
65-2 CRYSTAL STREET
Corning means research in Glass

HE CAN'T STAND PEOPLE TALKING ABOUT HIM!

That's why Kennecott is spreading the word to <u>your</u> potential customers about SKIMPY WIRING!

EIGHT OUT OF TEN HOMES in your area are haunted by Skimpy Wiring! He's the unseen electrical delinquent who strangles the free flow of power needed by today's modern home appliances. The sooner homeowners find out about this hidden pest, the better for your business. Because getting rid of Skimpy Wiring means *plenty of re-wiring jobs for you!*

STRAIGHT TALK IS THE ANSWER! You see, telling people the truth about Skimpy Wiring is the first step that turns prospects into actual customers. And that's exactly what Kennecott's adequate wiring advertising is doing!

ADS LIKE THE ONE BELOW appear in the Saturday Evening Post and This Week magazines. They're showing people *how to spot and how to get rid of inadequate wiring — actually tell readers to call you!* You can help yourself increase re-wiring business by using Kennecott's *national* wiring campaign as part of your own *local* promotion.

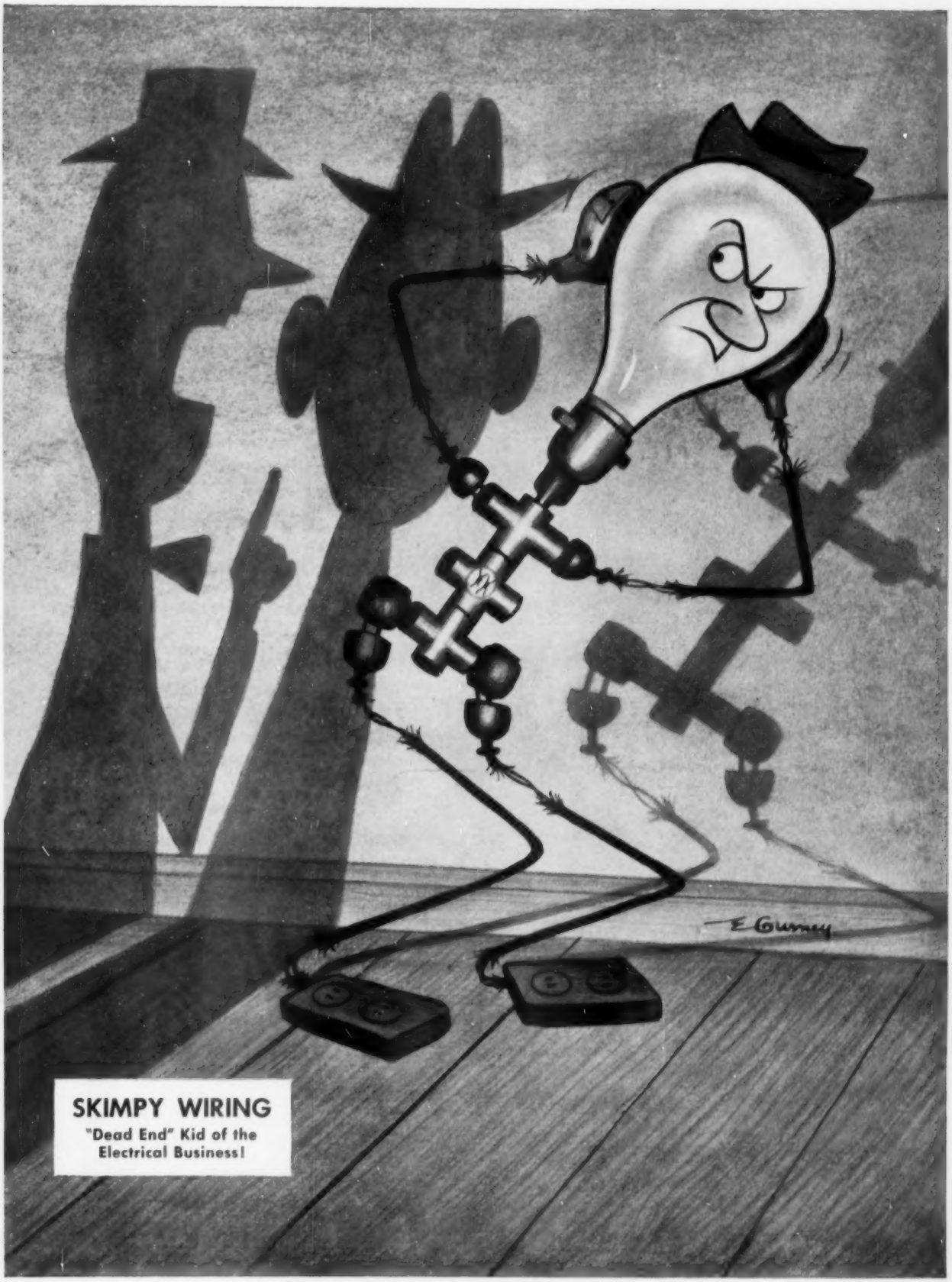


FREE! PROMOTIONAL MATERIAL!

Add punch to your own local drive for adequate home wiring! Send today for free reprints and poster-sized blow-ups of Kennecott's full-page Saturday Evening Post and This Week magazine ads. Get free copies of the educational booklet, "The ABC of Home Wiring." Ask for complimentary home wiring Wall Chart, mat service folder and list of *at-cost* prices for large-quantity orders of all material available. No cost or obligation! Just write Kennecott Copper Corporation, Dept. EC26, 161 E. 42nd Street, N. Y. 17, N. Y.

Kennecott Copper Corporation

Fabricating Subsidiaries: CHASE BRASS & COPPER CO. • KENNECOTT WIRE & CABLE CO.


SKIMPY WIRING
"Dead End" Kid of the
Electrical Business!
E. Gurney

What is your Control Need?



. . . a starter for a fractional hp motor?

This small inexpensive control provides thermal overload protection. . . . Compact construction permits mounting where space is at a premium. Designed for use on ac single-phase power systems . . . up to 230 volts.

. . . a controller for a 2300 to 5000-volt motor?

Here is a control for motors up to 2500 horsepower. All components — contactors, meters, overload relays, auxiliary switches — are selected to meet the particular requirements of your application. Current-limiting fuses give split cycle short circuit protection.

. . . or other applications?

Specific applications, including those between the above-mentioned limits, are made from an extensive line of starters and control components. These standard units are factory assembled in infinite combinations to meet practically any requirement. For help on a particular application, call your Allis-Chalmers representative. His recommendations are backed by Allis-Chalmers engineering departments . . . by experience gained solving thousands of control problems . . . by complete research and testing facilities.

A-4721

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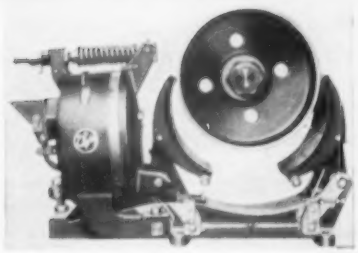
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Brake **(2)**

A new type "WB" brake, built to AISE and NEMA standards and designed for application to 600-series

An improved "Porta Drive" power unit for pipe threaders. With a 20-to-1 gear ratio, Porta-Drive is designed to power all standard geared pipe threaders. The unit is reversible. It threads 1- to 2-in. pipe using adapters, and will thread 2½- to 6-in. pipe with or without a vise. It can be used on the average shop work-bench and in absence of power can be operated with aid of a carpenter's brace. It weighs 14 lbs. Unit is also used to pull cable (with Greenlee cable puller) and to operate pulleys, hoists, and conveyors or to roll tubes in boilers.

Muncie Gear Works, Inc., Muncie, Ind.

A new adjustable thermostat comfort control on a new 20-in. portable window fan. Set the fan's thermostat once and the rise and fall in home temperature takes care of all ventilating problems. Too hot, the fan switches on; too cool and the fan spins to a stop. Fan is electrically reversible. It features 20-in. "wind tunnel" blades and can be used in windows or on floors. Two-side safety guards come out for easy cleaning. The fan's 3-speed switch delivers 3200 cfm in high speed, 2500 cfm and 1900 cfm in medium and low speeds.

Fasco Industries, Inc., Rochester, N. Y.

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The Editor
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New York 36, N. Y.

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  Use second line of boxes. Insert item numbers of literature desired.
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from an extensive line of starters and control components. These standard units are factory assembled in infinite combinations to meet practically any requirement. For help on a particular application, call your Allis-Chalmers representative. His recommendations are backed by Allis-Chalmers engineering departments . . . by experience gained solving thousands of control problems . . . by complete research and testing facilities.

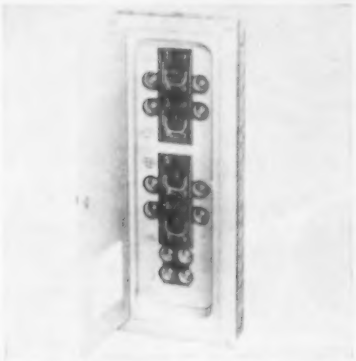
A-4721

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

Milwaukee 1, Wisconsin

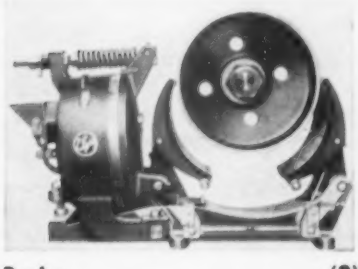
Product News



Service Entrance Panel (1)

A new fusible service entrance panel with 100-amp main lugs, four fuse pullers, and either 8 or 12 plug fuse branch circuits. Designed to supply adequate circuits and wiring protection for homes, the panel is suitable for the connection of several 240-volt appliance loads as well as a large number of 120-volt circuits for lighting and convenient outlets. It is listed by UL and rated for 120/240-volt ac, single-phase, 3-wire service. Main lugs and fuse pullers are parallel-connected. One 60-amp fuse puller in panel controls the plug fuse branch circuits. Another 60-amp puller controls the range circuit. And two wired-in 30-amp pullers are available for the connection of other 240-volt appliances such as dryer, water heater or air conditioner. Features that simplify installation include straight-in wiring at line and load terminals and a slide-out interior that can be removed to provide extra hand room for pulling in wires, then replaced and fastened without screws. Device is available in a general purpose enclosure with fronts designed for either surface or flush mounting.

General Electric's Trumbull Components Department, Plainville, Conn.



Brake (2)

A new type "WB" brake, built to AISE and NEMA standards and designed for application to 600-series dc motors, as used on overhead crane trolley drives, mill drives and similar devices. Available in 8-, 10-, 13-, 16-, 19- and 23-in. wheel diameter sizes, the spring set and magnetically released brake provides smooth braking action in both directions of rotation and also meets steel mill requirements for a brake of sturdy construction. Design features include a magnet case which can be quickly removed without disturbing brake adjustments, 100% lubrication of all bearings, accurate braking torque adjustment with a single bronze adjusting nut, single point brake shoe clearance adjustment, and armature air-gap adjustment requiring the use of only one wrench and utilizing a stainless steel threaded bushing and nut assembly. Brake wheels are fabricated of Ecamite alloy. Wheel face is ¼-in. wider than the brake linings. Each Type "WB" brake is equipped with canopy-shielded terminal connections and a manual release mechanism for use in emergencies. Mounting base dimensions, wheel sizes and torque ratings for each of various brake sizes meet current engineering standards.

Electric Controller and Mfg. Co., 4500 Lee Rd., Cleveland, Ohio



Power Unit (3)

An improved "Porta Drive" power unit for pipe threaders. With a 20-to-1 gear ratio, Porta-Drive is designed to power all standard geared pipe threaders. The unit is reversible. It threads 1- to 2-in. pipe using adapters, and will thread 2½- to 6-in. pipe with or without a vise. It can be used on the average shop work-bench and in absence of power can be operated with aid of a carpenter's brace. It weighs 14 lbs. Unit is also used to pull cable (with Greenlee cable puller) and to operate pulleys, hoists, and conveyors or to roll tubes in boilers.

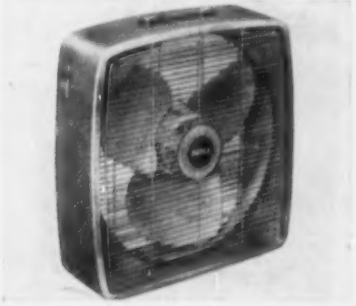
Muncie Gear Works, Inc., Muncie, Ind.



Rheostat (4)

A new 50-watt ring type rheostat designed specifically for use in electronic and industrial control equipment where severe mechanical shock is encountered. Designated as Type N152, they are designed to meet requirements of specification MIL-R-15109 and the Hi Shock requirements of MIL-S-901. Base, core and collector ring support assemblies are made of high dielectric strength glass-bonded mica. Features are shock resistant (Class HI), Class C insulation, "twin contact shoes" designed for smooth operation.

Ward Leonard Electric Co., Mt. Vernon, N. Y.

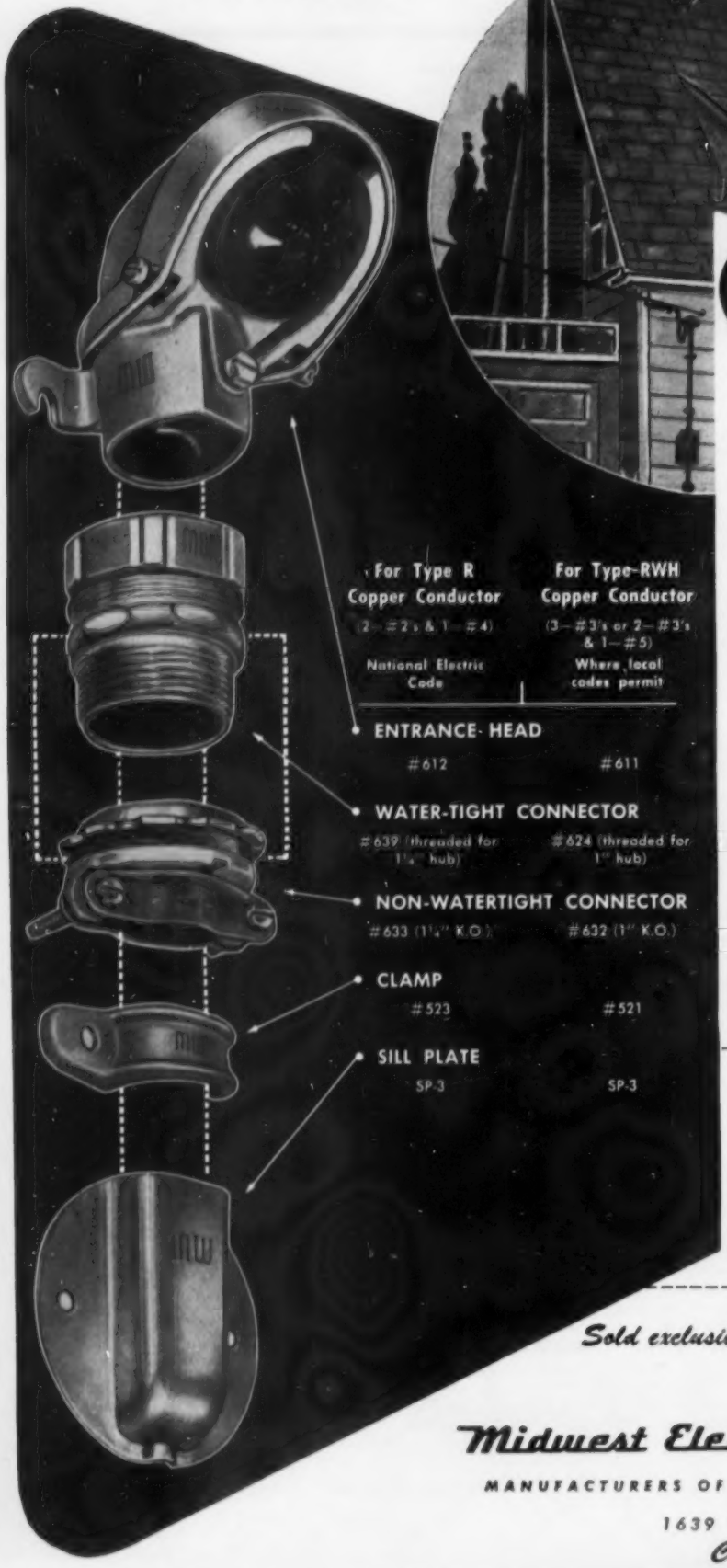


Window Fan (5)

A new adjustable thermostat comfort control on a new 20-in. portable window fan. Set the fan's thermostat once and the rise and fall in home temperature takes care of all ventilating problems. Too hot, the fan switches on; too cool and the fan spins to a stop. Fan is electrically reversible. It features 20-in. "wind tunnel" blades and can be used in windows or on floors. Two-side safety guards come out for easy cleaning. The fan's 3-speed switch delivers 3200 cfm in high speed, 2500 cfm and 1900 cfm in medium and low speeds.

Fasco Industries, Inc., Rochester, N. Y.

midwest FITTINGS ....





.... FOR YOUR 100 AMP SERVICE REQUIREMENTS— USING SERVICE ENTRANCE CABLE

• Here is an index of Midwest Catalog items, designed to meet your specifications for fast and rugged installations of modern 100 amp service entrances — using service entrance cable.

• This is a convenient guide to help you in selecting materials for these special installations.

●

UTILITIES

Our engineers have worked with utilities in various areas of the country in developing fittings for entrance cable. We invite your inquiry whether it involves copper or aluminum conductors.

Sold exclusively through Electrical Wholesalers

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1639 W. WALNUT STREET

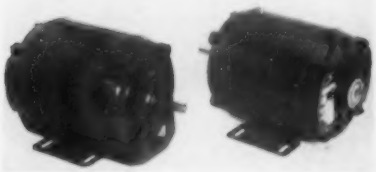
Chicago 12, Illinois



Plug-In Strip (6)

A new line of plug-in strip, equipped with an integral raceway to handle branch circuit conductors in addition to its standard use in providing electrical outlets. Designated as Type CF-4 plug-in strip, the new line was developed for a method of running branch circuits, 110 and 220-volt service, in the same duct that carries the plug-in strip harness. These provisions make possible a normal plug-in strip installation while providing the capacity to handle additional single-phase or 3-phase load within the limits of the No. 10 conductors. Underwriters' Laboratories have granted approval for installing up to three No. 10 Type TW electrical conductors in the raceway space located beneath the standard plug-in strip assembly. The additional conductors, in accordance with the Electrical Code, may be wired either 3-phase or single-phase. A ¾-in knockout at each end of a 6-ft strip, allows in-and-out accessibility of additional branch circuit wires without special feed fittings. It will serve primarily commercial and industrial applications with their characteristically heavier loads. Particularly adaptable for air-conditioning unit installations, strip is available with either standard 2-wire or grounded type receptacles every 6 or 18 in. Present standard Type CF-3 plug-in strip fittings will accommodate the new strip.

National Electric Products Corp., Gateway Center, Pittsburgh, Pa.



Motors (7)

A new 1/20 to 1/3 hp "48-Frame" motor line has been introduced. Innovations in the smaller, lighter motor is high-pressure-cast aluminum end brackets, precision machined and stress-relieved for permanent dimensional accuracy. For cooling, it features an integrally-cast, cluster-type aluminum fan. Square stator iron allows space for cooling air to pass between the frame and cores. Standard frame is drip proof. Totally enclosed, unit heater, permanent split capacitor types and others are available in both rigid and cushion base. Engineering data is available.

Century Electric Co., 1806 Pine St., St. Louis 1, Mo.



Transformers (8)

A new addition to the line of oil-filled transformers designated as Type LS has been announced. Capacity of units range from 100 kva to 5000 kva. Rating of the illustrated transformer is 100 kva class OA, 55° C rise, single-phase, 60 cycles, 33,000 volts with 2-2½% taps above and below, to 2400/4160Y volts. It features "pencil-slim" high-voltage bushings, built-in oil-level and temperature-indicator gauges and tap-changing mechanism. Element is immersed in triple-filtered hi-dielectric oil. Lifting lugs and other AIEE and NEMA accessories are included as standard equipment.

Marcus Transformer Co., P.O. Box 551, Rahway, N. J.

Mercury Lamps (9)

A new line of weatherproof heavy-duty, mercury and fluorescent-mercury lamps uses an outer bulb of a special hard, tough glass for maximum resistance to damage from weather and mechanical hazards. In outdoor applications, the outer bulb permits the new weather duty lamp to be installed in open fixtures. Indoors, the lamps are well-suited for use wherever moisture, corrosive vapors, or mechanical hazards require a heavy-duty lamp. The line supplements the standard line of mercury and fluorescent-mercury lamps in 400- and 1000-watt ratings, including E-H1, J-H1, A-H12, C-H12, A-H15, and B-H15 lamps. Weather duty lamps are physically and electrically interchangeable with their standard counterparts.

Westinghouse Lamp Division, MacArthur Ave., Bloomfield, N. J.



Service Entrance Kit (10)

Roof-top "periscopes" for bringing electric service lines into ranch type houses. Because of low roofs of these houses, the usual practice of bringing the lines in just below the eaves proved to be impractical in many instances. Each kit consists of an entrance head with slip-fitter adapter, a roof flange, mounting brackets for mast, and an adapter for meter connection. Kits are made up for use with either a 2-in. or a 2½-in. mast, and one or more pipe clamp wire-holders, which are supplied by the electrical contractor or the utility company.

Hubbard and Company, 6301 Butler St., Pittsburgh 1, Pa.



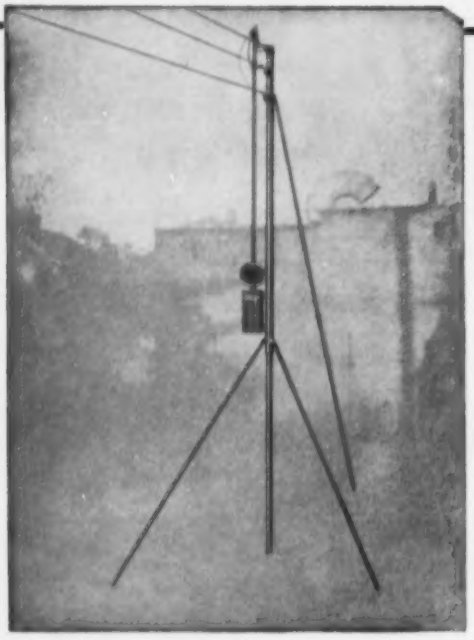
Batteries (11)

A new line of flat-plate motive power batteries, called Exide-Powerclad. They are premium flat-plate batteries with triple insulation, and are for use in electric industrial fork and lift trucks, mine locomotive power and marine applications. Powerclad positive plate grids are constructed of Silvium, Exide's patented corrosion-resistant alloy. Vitrex and perforated polyvinyl chloride retainers, a polyethylene insulating strip and a deeply grooved microporous rubber separator are used to achieve positive plate insulation.

Exide Industrial Division, The Electric Storage Battery Co., Box 8109, Philadelphia 1, Pa.

DON'T MAKE A PROJECT OF TEMPORARY SERVICE!

use MĪTI-MAST ®



PRODUCED BY THE ONLY EXCLUSIVE SERVICE MAST MANUFACTURER

EVERY UNIT INSURED FOR LIABILITY

1—Unit is self-contained and complete. Provides two 120 amp and one 220 amp outlet in rain-tight utility box.

2—6 ft. steel braces, back guy and 3 ft. center ground sleeve hold mast steady in all weather. Line load test (with guy) exceeds 1450 lb. pull.

3—Can be installed by one man in minutes.

4—Useable over and over—simply drive new ground sleeve and re-install mast.

5—Easily removed, hauled or stored. Telescopes to eight feet.

● Illustration shows temporary all-steel service mast providing power to job site. Mast raises service wires 12 feet above ground level—up to 18 ft. with extensions. Installation simple—(a) drive 3 ft. ground sleeve—(b) insert space pipe—(c) slide complete service unit into ground sleeve—(d) attach and secure steel braces.

Standard fittings include three heavy-duty insulators, entrance head, meter socket and rain-tight utility box equipped with padlock.

See your distributor, write or wire

MITI-MAST

Utility SERVICE COMPANY, INC.

1620 Thirteenth Street, Racine, Wisc.

Producers of Service Entrance Masts, Temporary Service Masts, Outdoor Telephone Booth Service Masts.

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Lights **(12)**

A new line of heavy-duty swivel lights for commercial and residential use, designed for ceiling mounting. Jarring or vibration will not change position of cones. Extra heavy-duty compression spring automatically compensates for heat expansion and wear. Swivel allows a full 360-degree horizontal rotation and up to 90-degree adjustment form vertical position, to place accent lighting where it is desired. All metal parts of swivel are diecast of corrosion-resistant alloy. Lights are available in six baked enamel finishes: coral, chocolate brown, green, black, oyster, and gloss gray; three plated finishes: copper, brass and satin chrome; and three shade styles, including the "Fabriglas" type with natural leaves or rattan embedded. Cones with plated finishes are furnished with perforations. All fixtures fit either 3¼-in. or 4-in. outlet boxes. Accessories include diecast louvers; color lenses in choice of red, amber, green or blue to be used with diecast louvers; and patented "hang-straight" assembly for use on slanted ceilings.

Prescolite Manufacturing Corp., 2229 Fourth St., Berkeley, Calif.



Staple **(13)**

A new BX staple called the "Buck-clip". Features are: legs of staple are raised to provide a 2-point hammering surface; four raised nibs provided on each leg; flat legs are used and legs are tapered to facilitate installation. For NMC and armored 3-wire No. 14, 12, 10.

Buck Electrical Manufacturing Co., 139-17 Highland Parkway, Roselle, N. J.

WHY WIRE AND CABLE JACKETED WITH NEOPRENE GIVE EXTRA-LONG SERVICE



NEOPRENE RESISTS WEATHERING — resists deterioration from exposure to sunlight, weather, and temperature extremes through long years of service.

NEOPRENE RESISTS OIL AND GREASE—and exposure to chemicals and solvents has little effect.

NEOPRENE IS RESILIENT—has excellent resistance to flex cracking, abrasion, chipping, cutting.

NEOPRENE PROTECTS AGAINST ELECTROLYTIC ATTACK—neoprene coverings protect lead sheaths from electrolytic action.

NEOPRENE WON'T SUPPORT COMBUSTION — provides maximum safety in danger areas where flame propagation is a serious hazard.

NEOPRENE RESISTS OZONE and **CORONA CUTTING** — neoprene resists both causes of deterioration equally well.

Neoprene's remarkable *balance of properties* is the big reason why it's the best jacketing material for wire and cable. Rugged neoprene jacketing gives maximum protection in conduits, above ground—even buried direct in earth. Neoprene has had over 20 years of successful field experience in all kinds of rubber products. You give your customers the dependability they expect when you specify wire and cable jacketed with neoprene. For full details get in touch with your wire and cable supplier.

NEOPRENE
The rubber made by Du Pont since 1932

DU PONT
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BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

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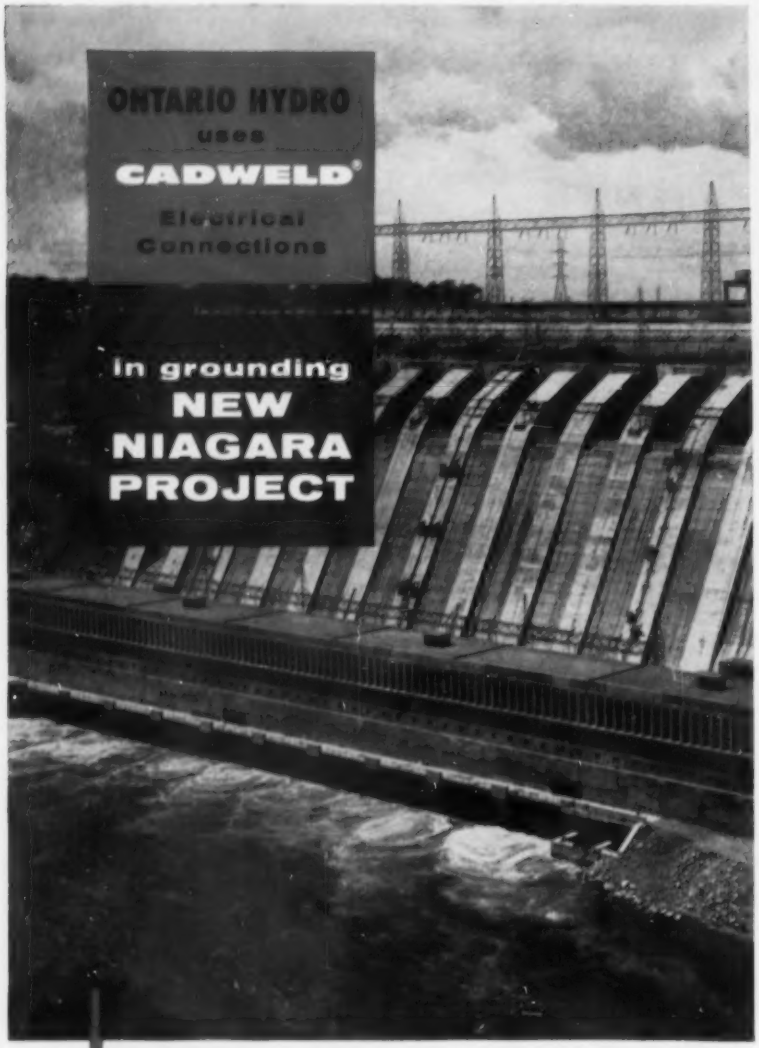
FREE! THE NEOPRENE NOTEBOOK. Every issue contains interesting stories about products made with neoprene. Actual case histories give you the facts about neoprene's longer service life. Clip coupon to get on the mailing list.

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Illustrated is the 12-unit phase (1,200,000 horsepower) of the new SIR ADAM BECK-NIAGARA Generating Station No. 2 on the NIAGARA RIVER. The overall development will have an ultimate installed capacity of 1,828,000 horsepower. GROUNDING connections in the powerhouse and switchyard areas are CADWELD—the permanent electrical connections that cannot loosen or corrode and eliminate maintenance.

CADWELD®

Erico Products, Inc.

2070 E. 61st Place · Cleveland 3, Ohio

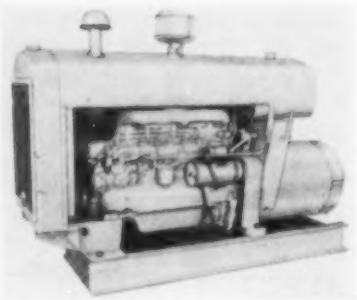
IN CANADA: ERICO INCORPORATED, 3571 Dundas St., West, Toronto 9, Ontario



Time Switch Case (14)

A new raintight case for several series of time switches, designed for protecting the mechanism from harmful weather elements in outdoor installation. Case is approved by UL. It is designed to accommodate the (TS60) standard On-Off Series, and the (TS66) standard switch with the skipper feature which permits operation on selected days. It will also accommodate both the T670 Series which has specially designed trippers for timings from 5-60 minutes and the T960 Series which can perform as many as 96 On-Off operations daily. Case is of heavy-duty (.067-in.) welded steel construction with top-hinged doors, and is 5¾ in. wide, 9¾ in. high, 3¾ in. deep. Convenient knockouts, three on the bottom and one on each side, provide access to terminal blocks. Other features are a rain-visor over top of door, a hasp for sealing or padlocking, and convenient mounting holes. Bulletin NR205 is available.

International Register Co., 2620 W. Washington Blvd., Chicago, Ill.



Generating Sets (15)

A new series of lightweight, large-capacity generating sets, powered by 4-cycle full diesel engines of six cylinders. They are directly coupled to generators turning at 1800 rpm. The new 1800 models are produced in 10-, 15-, 25- and 35-kw, and can be furnished with various controls. Literature is available.

Universal Motor Company, 540 Universal Drive, Oshkosh, Wis.



Mr. C. J. Cox (at right, above) supervises the installation of Okonite Splicing Tape on 2300 volt motor lead in Seabrook Farms food freezing plant. For 29 years Mr. Cox has standardized on Okonite splicing materials to assure water-tight seals on cables throughout the plant. Note moisture conditions indicated by frozen condensation on pump head.

Okonite Tapes resist moisture, freezing...

keep world's largest food freezing plant operating

For 29 years, Mr. C. J. Cox, supervisor of all construction and engineering for Seabrook Farms Co., has depended on Okonite Tapes to maintain the vast electrical network that keeps the world's largest food freezing plant operating. All electrical circuits (totaling 20,000 h.p. connected load), lights, as well as power for the motors and pumps which provide continuous freezing and storage capacity, are spliced and terminated with waterproof Okonite Tapes to assure positive protection against the moisture always present in the plant.

In every phase of Seabrook's operation, moisture is a problem. Treatment of food, freezing, processing, storing . . . all are damp operations with continuous condensation on cables and equipment alike. Low temperatures of the freezing and holding rooms make splicing difficult.

Okonite Tapes offer effective waterproof splices that are not affected by dampness or low temperatures. Both Okonite Rubber Tape and Okolite High Voltage Tape fuse into a solid self-vulcanizing wall of tough, waterproof insulation. Protected by Manson Friction Tape, splices maintain their moisture resistance through many years of exposure to condensation and freezing temperatures.

Try them on your own splices—write for this free box of 4 sample tapes to The Okonite Company, EC Tape Department, Passaic, N. J.



OKONITE  **splicing materials**

3521



QST-91 SHOWN ACTUAL SIZE 1½" X 1⅛" X 9/16"

Listed as Standard by Underwriters' Laboratories — Meets Federal Spec. WS-893.

ARROW AH HART

20 AMPERE INTERCHANGEABLE Quiette SWITCH

120-277 VOLTS A-C ONLY

Quiet, safe, mechanical operation for both incandescent and fluorescent lights.

Here's a shallow switch that you'll agree is made-to-order for today's thin-wall construction and correspondingly shallow wall boxes. *The A-H Interchangeable Quiette Switch — smallest 20 ampere switch available — is less than one inch in depth!*

For your fluorescent installations you'll require a switch that can handle the heavier starting current. Again, this heavy-duty switch meets your need quietly, efficiently.

On your re-wiring jobs, this switch will permit ganging up to three devices in one standard wall box. And you'll be wiring more residences with Number 12 wire, requiring this 20 ampere switch.

For inspection and identification purposes, the metal plate or strap on the front of each A-H 20 ampere switch is colored red.

Available to you in single, double, 3-way or 4-way, with large binding screws and Ivorylite or Brown handles. Optional feature is Glo-Tip on handle so switch is instantly located during darkness.

Write for new folder (Form A-198) "A-H Quiette Switches Meet Every Lighting Requirement."

ARROW AH HART

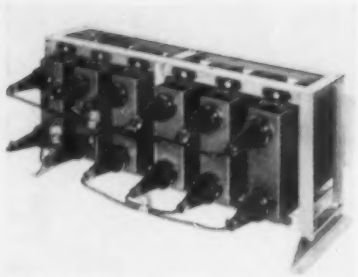
Wiring Device Division

THE ARROW-HART & HEGEMAN ELECTRIC CO.

103 Hawthorn Street, Hartford 6, Connecticut

Offices and Sales Engineers in Principal Cities

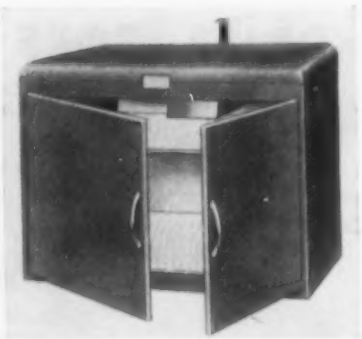
Quality WIRING DEVICES • MOTOR CONTROLS • ENCLOSED SWITCHES • APPLIANCE SWITCHES



Capacitor Equipments (16)

Submersible capacitor equipments are designed for secondary network applications. Equipments are available in either 40-, 80-, or 120-kvar banks and are rated 216 volts, 3-phase. They are mounted in a supporting structure for installation in underground network vaults. They are designed for minimum space requirements and can pass through a 30-in. diameter manhole opening. They can be stacked a maximum of three tiers high and can be floor-, wall-, or ceiling-mounted in various arrangements to fit the limited space available in network vaults. Ambient temperature limits are 55°C for single tier equipments and 40°C for two or three tier equipments. Each equipment consists of a group of single-phase capacitor units rated at 13⅓ kvar, 216 volts, with one terminal-mounted current limiting fuse. Terminals are enclosed in neoprene covers made watertight by clamps at both ends.

Line Material Co., 700 W. Michigan St., Milwaukee 1, Wis.

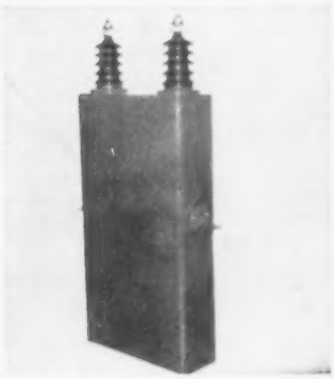


Electric Oven (17)

A new portable electric oven for industrial uses including: baking enamels, lacquer, wrinkles and other finishes; for dehydrating bobbins, coil forms, paper tubing; for drying plastic granules and preheating sheets, parts after cleaning; for preheating molds; for all types of processing; for laboratories and other uses. Features include uniform temperature throughout. Fresh air is drawn in and stale air driven out through specially located vents by means of a fan driven by a motor mounted on the outside of the unit.

Adjustable damper gives wide range of constant temperature. Oven is so constructed that one will nest on top of the other. They can be used in groups and can be operated as individual ovens or selected ovens in the group can be cut out or heated at different temperatures. Construction is heavy gauge steel. Asbestos air-cell insulation. It can be operated from any 110-volt outlet. Units are available for dc. Inside dimensions are: 28¼-in. wide, 24-in. deep, 20¼-in. high. Removable shelf permits use of entire height.

Grieve-Hendry Co., Inc., 1401 W. Carroll Ave., Chicago 7, Ill.



Capacitor (18)

G-E's new 50-kilovar power capacitors have had their dimensions altered to make them fit racks designed for 25-kvar units. The new unit will have the same high operating reliability and the same base dimensions as the 25-kvar model, but will be 11 in. taller, 32 in. to top of bushings. It will weigh about 110 lbs. New units will be available in 5 and 8.7 kv classes.

General Electric Co., Schenectady 5, N. Y.

Tester (19)

A new automatic tester, called the Robotester. Using a punched tape to program test points and parameters, it performs up to 120 complete circuit measurements per minute and has a capacity of 240 test points per set-up. Between any two of 240 points, there are over 57,000 possible measurements or tests per set-up. It will pick up from 70% to 90% of failures or defective parts. It can be used to test virtually any electronic or non-electronic equipment operated by wires or tubes. It weighs 45 lbs, is 20 in. wide, 13¼ in. high and 18 in. deep, overall. The function of the tester is to determine whether correct connections have been made, correct components installed, and whether parts are themselves not defective.

Lavoie Laboratories, Morganville, N. J.



CHOOSE THE ONLY

Complete Line

ARROW AH HART

MANUAL STARTERS

FULFILL EVERY REQUIREMENT OF YOUR BIGGEST CUSTOMER . . .

INDUSTRY

Keeping up with Industry's torrid pace requires specifying electrical equipment that fulfills *every* requirement and can be wired and serviced in a hurry. You'll find that Arrow-Hart's *complete* line of single-phase and three-phase Manual Starters meets these qualifications.

Ratings range from fractional hp up to 7½ hp, 600 volts. You can have push button or toggle types, with or without overload protection, for 1, 2, 3 or 4 pole use.

All starters are supplied in whatever type NEMA enclosure you require — general purpose . . . weatherproof . . . explosion-proof. Plenty of wiring room and large terminal screws will speed up your installation and servicing.

Write for free 12-page catalog section describing the complete line of A-H Manual Starters.

ARROW AH HART

Motor Control Division

THE ARROW-HART & HEGEMAN ELECTRIC CO.

103 Hawthorn Street, Hartford 6, Connecticut

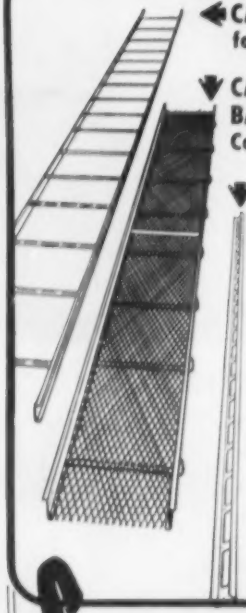
Offices and Sales Engineers in Principal Cities

Quality MOTOR CONTROLS • WIRING DEVICES • ENCLOSED SWITCHES • APPLIANCE SWITCHES



ALUMINUM
OR GALVANIZED STEEL
SUPPORT SYSTEMS
FOR POWER AND CONTROL CABLES
IN-FREE-AIR
DESIGNED AND DEVELOPED BY HUSKY PRODUCTS

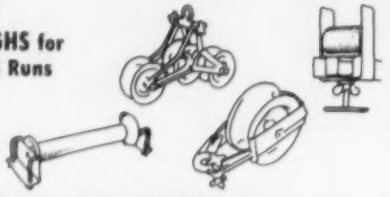
A SINGLE SOURCE OF SUPPLY
FOR A SYSTEM
Complete to the Last Bolt



CABLE RACKS for Power Circuits
CABLE BASKETS for Control Circuits
CABLE TROUGHS for Limited Runs



LONG SPAN SUPPORTS for Bridging Applications



INSTALLATION TOOLS for fast cable "pulls"

PLUS over 1,000 items of accessory hardware including:

hanger clips	suspension fittings
hanger rods	wall brackets
support channels	cable clamps
pipe spacers	cable banding
concrete inserts	insulator blocks

Lowest Ultimate Installed Cost
THRU SAVINGS IN FIELD ERECTION

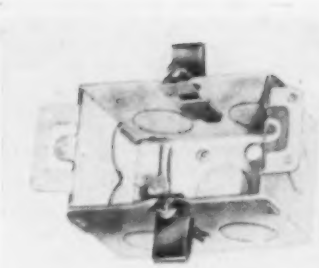
- LIGHTWEIGHT ALUMINUM—faster installation
- LONG SPANS—fewer supports
- LONG LENGTHS—fewer splices
- HEAVY LOAD CAPACITY—fewer runs

★

Design and layout assistance available
Unit responsibility assumed
Over 2,000 completed installations—Send for catalog.

AVAILABLE THROUGH LEADING CABLE MANUFACTURERS

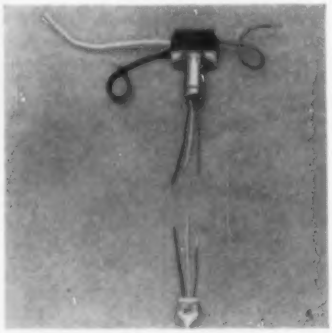
HUSKY PRODUCTS, INC.
5300 VINE STREET, CINCINNATI 17, OHIO



Outlet Box (20)

Specifically developed for rewiring work, the newly designed "Gem Dandy" switch and receptacle box features side pressure clamps which hold box securely against plaster or dry-wall construction up to 1-in. thickness. Clamps, inserted from inside after box is placed in wall cut-out, are drawn up tight against back of wall by long screws. Top and bottom "ears" are integral part of box and hold it against wall face. Standard dimension box is made of No. 14 gauge steel with galvanized finish. There are two ½ in. conduit knockouts in each side, one in back and one in one end. The other end has two pry-outs with dual clamp for flexible cable connections. Unit is UL approved.

Chris Buckles, Inc., 2300 *South Springfield Ave., Chicago* 23, *Ill.*



Wiring Device (21)

A new low-voltage wiring device with a built-in transformer, called Remcon, allows homeowners to control a single outlet or fixture from any number of switches conveniently placed throughout the house. To install, the contractor fits a Remcon unit into the outlet box and matches the three wires of the unit to the three wires of the switch. No separate transformer is required. Only 6 volts are required to activate the outlet, and No. 18 bell wire is used. Each Remcon circuit is an independent, self-contained unit, allowing installation at one outlet or at every outlet in the house. Catalog is available.

Pyramid Instrument Corp., Lynbrook, L. I.

Always in DEPENDABLE SUPPLY!



U. S. Royalastic PLASTIC TAPE



This versatile tape does the work of both rubber *and* friction tapes on many jobs. Complete mechanical and electrical protection. Good tensile strength and high resistance to water, oils, acids, alkalies, corrosive chemicals. Easy to manipulate in cramped spots. Good stretch and adhesion. Approved by Underwriters' Laboratories, Inc.

You can get immediate delivery by getting in touch with any of United States Rubber Company's many distributors, any of the 27 "U. S." District Sales Offices, or write us at Rockefeller Center, New York 20, New York.

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Mechanical Goods Division

United States Rubber

GARCY *Speed-line*®

PATENT PENDING

LABOR SAVING

on continuous-row lighting installation

WINS CONTRACT

for Electric Service Co., Eau Claire, Wis.



1 **12:53 PM**—Everything ready to begin installation in this typical Eau Claire classroom: Hickeys, to take Garcy Adjustable Stem Hangers, have been previously attached to ceiling. Garcy Speed-line Visualier bulk-packed fixtures have not yet been removed from cartons.



2 **1:00 PM**—Wireway channels have been unpacked and laid out along sawhorses. Wireway covers have been removed and Speed-line couplings, inserted between fixtures, are being fastened in place. The four individual fixture wireways now make a rigid continuous 28-foot assembly.



CLASSROOM LIGHTING INSTALLED



5 **1:20 PM**—The first row has been leveled and lamped, and the workman is attaching the last of the separate louver shields. Meanwhile the other two workmen have been repeating the wireway assembly procedure for the second row.



6 **1:32 PM**—The second lamp row has been assembled and installed . . . just 12 minutes after completion of the first row.

Estimating that $4,482 could be saved by using the Garcy Speed-line System instead of separate external mounting channels, Electric Service Co. submitted the winning bid for relighting the Eau Claire Senior High School.

The potential savings of the Speed-line System were well known to E. F. Klingler & Associates, architects, who supervised the job of relighting and rewiring 22 standard classrooms, about 750 feet of corridor, plus storage space, toilets, etc. The architects invited all bidders to submit an alternate figure based on Speed-line savings. In their successful bid, Electric Service Co. figured that Speed-line would save more than 50% of installation labor costs. Their faith in Speed-line was amply justified . . . as indicated by the remarkable series of progress photographs pictured here.

Learn how Speed-line can cut installation labor costs 50% and more on continuous-row lighting

Send today for Bulletin 551-L

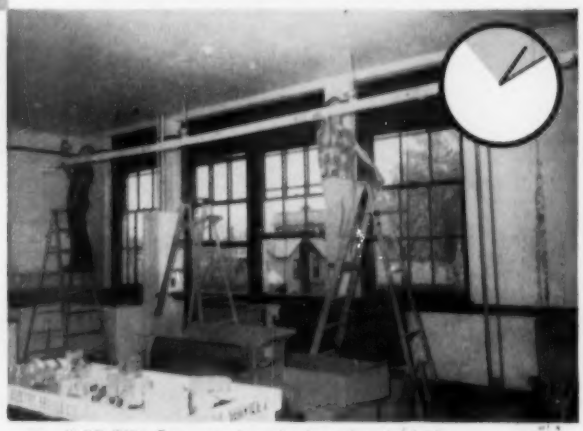
GARCY

Quality by Design

GARDEN CITY PLATING & MFG. CO., 1730 N. Ashland Ave., Chicago 22, Ill.
In Canada: Garcy Co. of Canada, Ltd., 191 Niagara St., Toronto



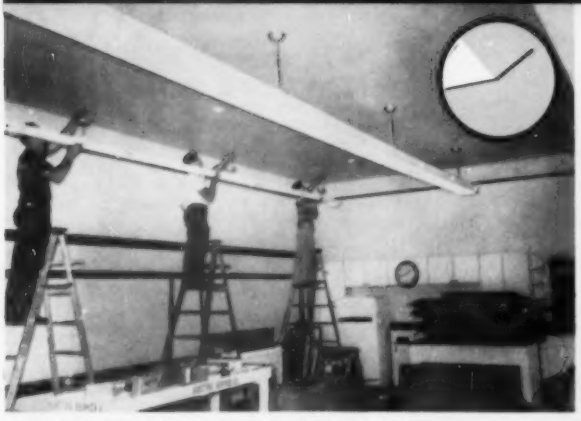
3 **1:08 PM**—Wiring connections have been completed, wireway covers have been replaced . . . all this at convenient working level, not perched on top of ladder. Garcy Adjustable Stem Hangers have been clamped to assembly. Hanger canopies have been placed over stems.



4 **1:09 PM**—In one minute's time the rigid 28-foot assembly has been carried up the ladders, and stem hangers hooked into ceiling hickeys. No lock nuts, no washers are needed.



BY 3 MEN IN LESS THAN 1 HOUR



7 **1:43 PM**—Wireway for the third and last row is carried to the ceiling.



8 **1:51 PM**—All three rows installed, lamped and lighted. Elapsed time, 58 minutes. Saving in labor costs permits budget-wise use of Garcy Visualier, finest in school and office lighting.

IN THE BLACK– WITH WHITE?



. . . you are with

DIAMOND DTX®
NON-METALLIC SHEATHED CABLE

● Diamond DTX is *really* white! Non-sticking, smooth and easy to pull.

- Walls stay clean!
- Hands stay clean!
- Does not flake off!

For a fast, clean installation . . . get DIAMOND DTX!

Write today for Catalog and Samples.

Trade Mark ®

DIAMOND WIRE & CABLE CO.

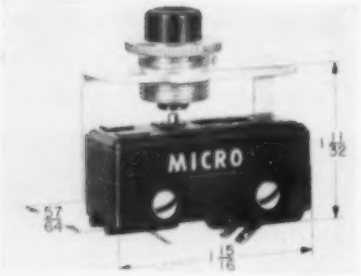
SYCAMORE, ILLINOIS



Adapter (22)

Sharp bends at terminations of armored cable runs can be reduced or eliminated with a new 45° adapter now available. Designed for use with standard sizes of armored cable and cable terminators, it permits bringing cable into switchgear or other housings at angle, instead of at right angles, in locations where this simplifies installation or where space is insufficient to permit bends in large-diameter cable. Type TFA terminating fitting adapters are supplied in sizes to fit PLM Type AC or ACS 20 to 34 terminators for armored cable from approximately 2 to 3½ in. in diameter. Adapters are supplied complete with gaskets, bolts, nuts and lock washers.

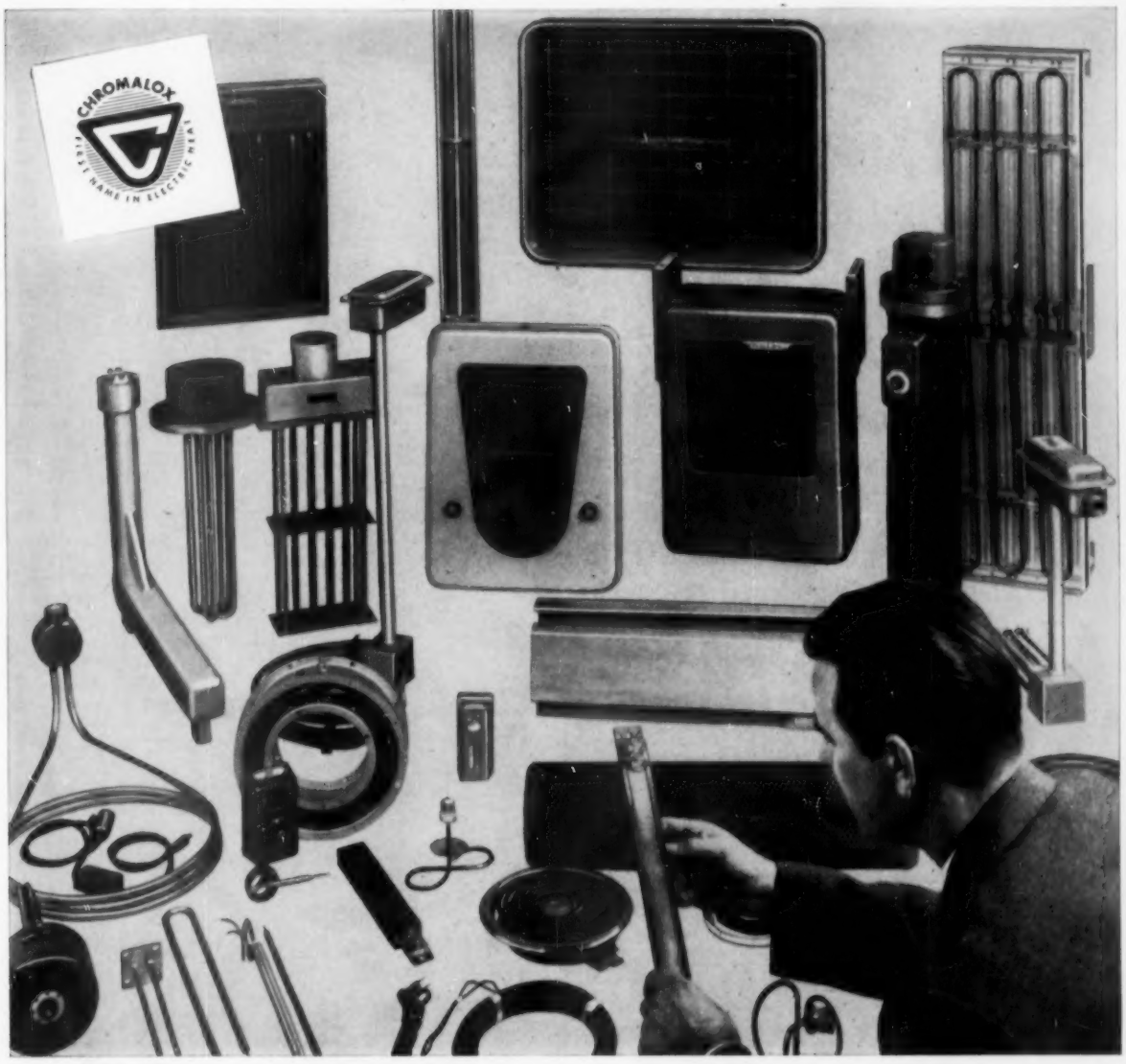
PLM Products, Inc., 3871 *W. 150th St., Cleveland Ohio*



Pushbutton Actuators (23)

A new series of pushbutton actuators for snap-action switches, designated 4MA and 5MA series. They are especially useful in electrical computers and similar devices. Only a plastic pushbutton and a smooth clear anodized bushing are exposed above the mounting surface. Buttons of both ½ in. and 1 in. diameter are available in a choice of red, green or black plastic. Many different types of basic switches can be used with the actuators, including hermetically sealed switches, high capacity switches, double-pole double-throw switches and magnetic blow-out switches. The actuator can be mounted through panels of 1/16 to ½ in. thickness.

Micro Switch, Freeport, Ill.



Picture of a man with the ANSWERS!

Chromalox Electric Heating Equipment can put you in every phase of an important growing business. In the Home, Commerce and Industry, electric heating applications offer new and promising sales opportunities.

With Chromalox heating equipment, you can answer every heating problem—electrically. 15,000 standard types, sizes and ratings. World's largest stock. Available for immediate delivery. Complete range of controls and accessories. Nationwide sales-engineering service.

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Please send me the literature checked below:

- ☐ General Industrial Electric Heating Units
- ☐ Industrial Radiant Heaters
- ☐ 101 Ways to Apply Electric Heat
- ☐ How to Solve Winter Problems with Electric Heat
- ☐ Process Air Heaters
- ☐ Electric Heaters for Electroplating
- ☐ Thermwire Heating Cable
- ☐ Cartridge Heaters
- ☐ Circulation Heaters
- ☐ Strip Heaters
- ☐ Comfort Heaters
- ☐ Electric Range and Water Heater Units
- ☐ Baseboard Heaters
- ☐ Radiant Wall Panels
- ☐ Fan Driven Wall Insert Heaters
- ☐ Hi-Flow Portable Heaters
- ☐ Utility Spot Heaters

Name _____ Title _____

Company _____

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City _____ State _____



Now packed in handy carrying carton

RUGGED DURABLE DEPENDABLE

PORCELAIN PRODUCTS

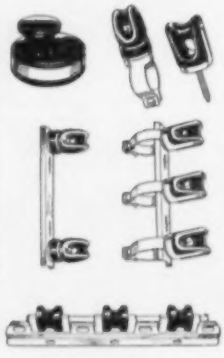
WIREHOLDERS

AND SECONDARY SERVICE MATERIALS



Where *quality* and *performance* are necessary for continuous line service—Porcelain Products wireholders and secondary service materials *assure* reliability. They're engineered with strong, sturdy construction—metal in tension, porcelain in compression. Steel parts are hot-dip galvanized . . . screw threads are extra sharp, lubricated for ease of installation. Larger, pulley-action wire hole, for large wire sizes—prevents chafing, wire wear.

These EXTRA features—*plus*—Porcelain Products "Quality Line" reputation, make an unbeatable combination . . . SPECIFY PORCELAIN PRODUCTS wireholders and secondary service materials.



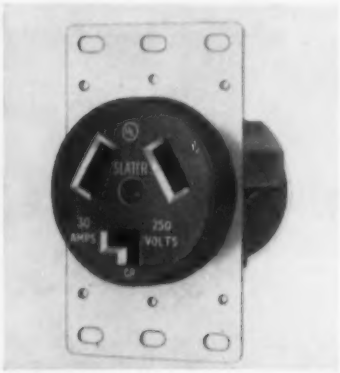
62 Years **Porcelain Products, Inc.** PP INC.
FINDLAY, OHIO



Lamp (24)

A new all-purpose portable lamp, known as the "Giraffe Lamp", is designed for industrial, laboratory, office or home use. It enables the user to direct light wherever required. The No. ML-1 lamp has a heavy-duty all-porcelain socket and fiber-glass insulation that permit the use of reflector infrared heat lights if desired. The socket features a key-type switch located atop the aluminum reflector, which is beaded with a soft molded rubber edge. All parts are finished in a combination of chrome and baked grey enamel. A 60-watt "Daylight" type bulb is suggested for most applications.

Asco Products Division, Atlas Sound Corp., 1449-39*th St.*, *Brooklyn* 18, *N. Y.*



Outlets (25)

Two new range and dryer receptacles have been made available. The range receptacle, No. 3890, is rated 50 amps 250 volts; the dryer receptacle, No. 3860, is rated 30 amps 250 volts. Both power outlets are flush type for quick flat strap mounting and incorporate such features as: clamp elevator-type terminals; phosphor-bronze contacts, a patented revolving rear plate. Designed for use on single gang boxes, they can be back-wired. NEMA "L" shaped slot on dryer receptacle only. Catalog No. 38 is available.

Slater Electric & Mfg. Co., Inc., *56th St. and 37th Ave.*, *Woodside*, *L. I.*, *N. Y.*



Circuit breaker making an important decision

This is a Heinemann hydraulic-magnetic circuit breaker in operation.

It is remarkable for its ability to sort out dangerous current overloads and short circuits from starting inrush and other harmless, momentary overload conditions. It makes an unfailing decision and, accordingly, opens the circuit or keeps power flowing.

The decision it will make is an important one, for upon it depends the life of costly electrical equipment and wiring. A wrong decision to *open* the circuit could result in needless service interruption . . . inconvenience, waste in man-hours and production time. In wrongly deciding *not* to break the circuit, it could cause motor burnout, damage to electronic equipment or transformers, wiring deterioration.

WHY ALWAYS THE RIGHT DECISION?

The Heinemann Circuit Breaker always makes the right decision . . . a decision that is never influenced by surrounding temperatures . . . because its hydraulic-magnetic operating principle is based on power, not heat. (And for this reason Heinemann Circuit Breakers always carry full rated current, never require de-rating.)

TIME DELAY FOR OVERLOADS . . . INSTANTANEOUS SHORT CIRCUIT PROTECTION

The Heinemann Circuit Breaker responds with inversely proportioned time delay to overloads, eliminating nuisance stoppages. Time delay is matched directly to the characteristics of the circuit or equipment to be protected.

At 10 times its rated current, it trips instantly . . . even before the sudden burden on the line can nudge an ammeter needle . . . providing the fastest, surest protection available.

The decision *you* make in specifying a circuit breaker is important, too. That's why more designers have turned to Heinemann for the logical solution to circuit protection problems.

Send for your copy of Manual 101, "WHAT YOU SHOULD KNOW ABOUT CIRCUIT BREAKERS."

HEINEMANN

ELECTRIC COMPANY

Circuit breakers

132 Plum St., Trenton 2, N. J.

FAST

is the word for these efficient little

RIDGID

Drop-Head Dies!



Easy threading of ⅛" to 2" conduit

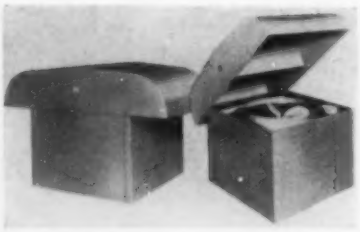
Snap size head you want into ratchet drive ring, from either side—it can't fall out. Dies reverse easily for close-to-wall threading. 00R and OR, ⅛" to 1"; 111R and 11R, ⅛" to 1¼"; 12R, ⅛" to 2". Free carrier with sets. Pipe dies available. Real work-savers—at your Supply House!



RIDGID Bolt Threaders, too—No. OOR-B, ¼" to 1", National Coarse or fine thread, efficient drop-head dies.

RIDGID
Work-Saver Pipe Tools

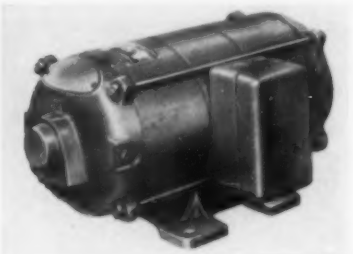
The Ridge Tool Company, Elyria, Ohio, U. S. A.



Roof Ventilator (26)

A new propeller-type roof ventilator with fans from 12 to 48 in. and capacities from 640 CFM to 22,000 CFM. Unit is weatherproof and low in silhouette and recommended for exhaust duty on commercial and industrial buildings. It discharges air in downward direction. Shutters are mounted at bottom of unit so that rain, wind or snow will not effect operation. Automatic or motor driven shutters are furnished. All units are equipped with disconnect switches to prevent power from being accidentally turned on while unit is being serviced. Removal of two cap screws permits lid to be opened for any servicing required. Bulletin SDA-143-7 is available.

Peerless Electric Company, Fan and Blower Division, Warren, Ohio



Generator Sets (27)

FHP motor-generator sets, in frame sizes 44, 66 and 74. Recommended as a reliable means of obtaining dc from an ac power source, units are used as a power supply for product testing in plant laboratories, as power supply for variable speed motors, and as self-contained exciters of larger units. They are also used to supply energy for such industrial devices as magnetic chucks. Continuous operation at rated load is made possible by a ventilating system incorporating a fan on the shaft between the units. Air enters through side vents, passes over both units, and is exhausted through bottom of set. Both motor and generator rotors are mounted on a common shaft. Designated as type LB m-g sets, the compound-wound units are of drip-proof, ball-bearing, solid base design. They are available in various input combinations of standard frequencies, voltages, and phases, and with 250-, 500- and 750-watt dc outputs.

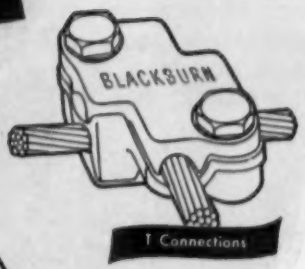
General Electric Co., Schenectady 5, N. Y.

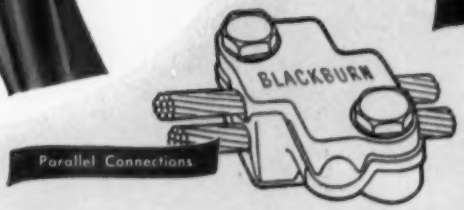
You can handle a wide variety of jobs with this

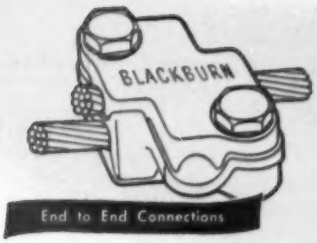
Stronger, More Versatile BLACKBURN Cross Tap CLAMP











Get quick service for a large number of different connection and wiring jobs with BLACKBURN'S Cross Tap Clamp.

- **Eight connectors accommodate cable sizes from #6 to 1000 MCM.**
- **Made of high strength copper alloy; silicon bronze bolts; phosphor bronze shakeproof lockwashers.**
- **Rounded edges for easy taping.**
- **Greater wrench rotation with either end or sucket type speeds installation.**
- **Available from Electrical Distributors everywhere.**

Also available completely tin plated for general purpose work.

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35 Madison Street • St. Louis 6, Missouri • Phone MAin 1-2821

for Better and Easier-
STORE FRONT LIGHTING INSTALLATIONS

Revere ELECTRIC MFG. CO. CHICAGO, ILL. **WALL and ROOF BRACKETS**

(PATENTS PENDING)

EASIEST TO WIRE AND INSTALL

ARM AND LUMINAIRE WIRED IN ADVANCE. FITTER SLIPS OVER POST AND YOUR HANDS ARE FREE.

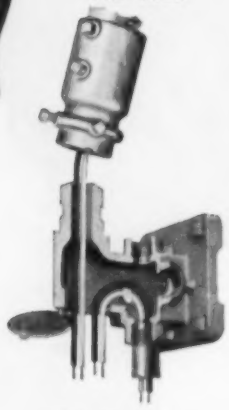
AMPLE ROOM BELOW TRANSFORMER. BIG SPLICE BOX HAS 4 TAPPED HOLES.



NOTE HOW WIRES FROM ASSEMBLED ARM AND LUMINAIRE RUN STRAIGHT THROUGH. "X" TYPE SPLICE BOX PERMITS CONNECTIONS FROM TOP, BOTTOM AND SIDES.



Cat. No. 861
Wall Type Bracket Only

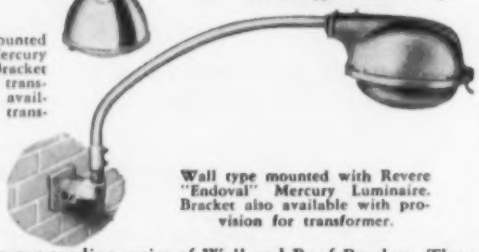


Cat. No. 860
Wall Type Bracket Only.

NOTE LARGE, CURVED RACEWAY WHICH PERMITS EASY FISHING.



Roof type mounted with Revere Mercury Luminaire. Bracket shown with transformer. Also available without transformer.



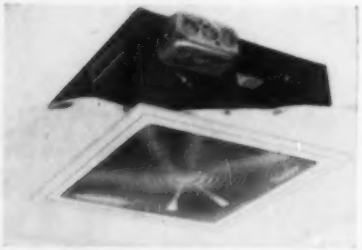
Wall type mounted with Revere "Endoval" Mercury Luminaire. Bracket also available with provision for transformer.

Revere scores again with this outstanding series of Wall and Roof Brackets. They are Superior in Design — Quality and Performance . . . of Heavy-Duty Cast Aluminum Construction and save hours in Installation time through simplified provision for wiring. Available with 1¼ inch aluminum arms or with hot-dip galvanized steel arms for mounting Revere Mercury or Incandescent Luminaires. Arms are locked in position with heavy cup-point screws. Roof type arm swings over parapet. Wall type swings back to wall for safe, easy servicing.

Write for Catalog Data and Prices

REVERE ELECTRIC MFG. CO. • **6009-17 BROADWAY** • **CHICAGO 40, ILL.**
Available in Canada thru Curtis Lighting, Ltd., Leaside, Toronto, Ontario

THE ONLY COMPLETE LINE OF LUMINAIRES - FLOODLIGHTS AND POLES FOR STREET - SPORTS AIRPORT - SERVICE STATION - OUTDOOR THEATRE - MARINE AND INDUSTRIAL LIGHTING



Incandescent Fixture (28)

A new incandescent recessed mounted hinged 12-in. square Lenslite. It may be used for individual, continuous, square or rectangular pattern mounting. Fixture is available with either a louvre bottom, flat lens, drop lens bowl, or drop alba bowl. They are supported with adjustable jack clamps, which hold the fixture firm and snug against the ceiling. A specially designed unseen pivot hinged door cannot damage ceiling when swinging down. Fixture is equipped with Alzak reflector. Flange and door are in Neo-Lux baked white enamel finish. Outlet box is removable from inside of fixture. Catalog No. 545 is available.

Neo-Ray Products, Inc., 315 East 22nd St., New York, N. Y.



Service Entrance Panel (29)

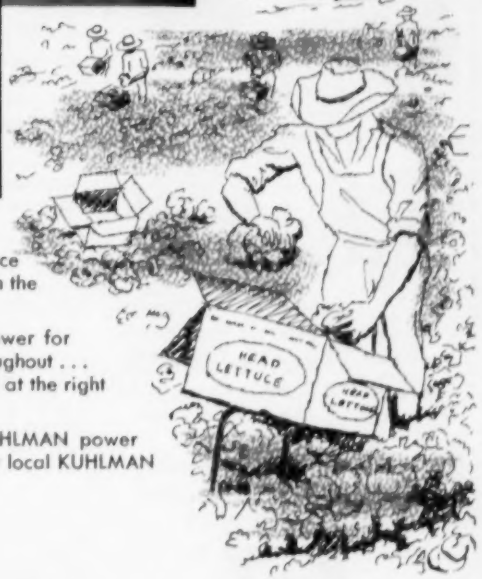
An exclusive new fusible service entrance panel with five fuse pullers and eight plug fuse branch circuits. Designed to provide for adequate wiring in the modern electrified home, the new fusible device supplies adequate circuits for several 240-volt appliances such as range, clothes dryer, water heater and air conditioner, as well as for 120-volt lighting and small appliance loads. Home builders and electrical contractors will find the new panel especially suitable for homes with built-in kitchen appliances such as wall ovens and separate surface cooking units. It is listed by UL and rated for 120/240-volt ac, single-phase, 3-wire service and has 100-amp main lugs. Main lugs and fuse pullers are parallel-connected. In this design, one 60-amp puller controls the eight plug fuse branch circuits. Another 60-amp

progressive california lettuce industry

SELECTS KUHLMAN

POWER CENTER TRANSFORMERS





Packed in cartons in the field and refrigerated . . . California lettuce reaches any part of the world as fresh as the day it was picked . . . with the help of KUHLMAN power.

The KUHLMAN 750 KVA power center, illustrated above, supplies power for one of California's ultra-modern lettuce packing plants. KUHLMAN throughout . . . a network of small dry type transformers puts power where it is needed at the right voltage for each carton manufacturing operation.

Specify KUHLMAN for your plant modernization . . . you'll find KUHLMAN power centers can meet your special requirements. Get all the facts from your local KUHLMAN representative.

KUHLMAN ELECTRIC COMPANY

BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA



Everyday
MORE and MORE
CONTRACTORS
SWITCH TO
UNION'S
NON-METALLIC
BOXES TO
CUT COSTS
Check UNION'S
BRACKET BOXES



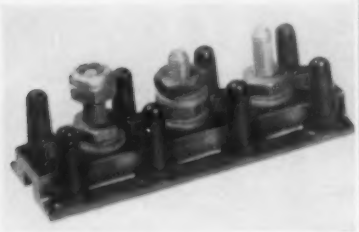
DESIGNED FOR ON-THE-JOB SAVINGS IN —

BOX MOUNTING
KNOCKOUT REMOVAL
PLASTER-FREE THREADS
LOW UNIT COST

UNION INSULATING CO.
PARKERSBURG, WEST VIRGINIA

puller controls the range circuit. And two wired-in 30-amp pullers are available for other 240-volt appliance circuits. A third 30-amp puller for 240-volt appliances is independent. It is enclosed in a sealable compartment for use with separately metered equipment such as off-peak water heaters. Features include straight-in wiring at line and load terminals to eliminate fumbling with looped wire ends, and an exclusive slideout interior that can be removed to provide extra hand room for mounting box and pulling in wires, then replaced and fastened securely without screws. Device is available in a general purpose enclosure with fronts designed for either surface or flush mounting.

General Electric's Trumbull Components Department, Plainville, Conn.



Terminal Strips (30)

New low-cost terminal strips feature post-type barriers and studs for attachment to one or more terminal-ended or looped wires. These light weight units are adaptable to many low voltage applications. Strips are available with No. 6 studs in from one through 20 circuits, with No. 8 or No. 10 studs in from one through 16 circuits, and with ¼ in., 5/16 in. and ⅜ in. studs in from one through eight circuits. Standard strips are of a commercial grade molding compound and can be supplied to various government specifications and with various types of hardware, where required.

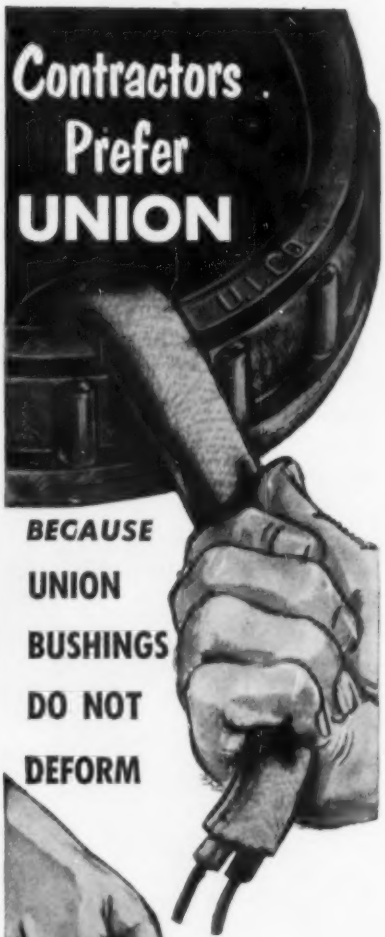
Buchanan Electrical Products Corp., Hillside, N. J.

Machine (31)

A new machine for stringing overhead power line conductors under controlled tension. Model 6000-WS, takes all conductor sizes up through 1⅛-in. diameter, and any size and type of reel that any of these conductors are currently being provided as standard from wire mills. The braking takes place over the double bull wheels that are of cast aluminum alloy and are neoprene lined to prevent damage to conductors and slippage. One reel tender can control the brakes on one of these units holding two reels, or with two units, if placed together, stringing up to four conductors simultaneously.

Petersen Engineering Company, Santa Clara, Calif.

Contractors . Prefer UNION



BECAUSE
UNION
BUSHINGS
DO NOT
DEFORM

FISH
WIRES
DO NOT
CUT

BEWARE
OF
SUBSTITUTES



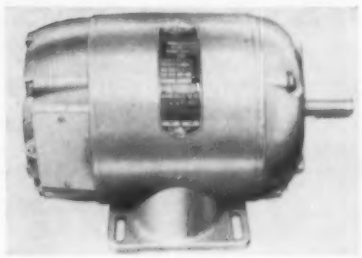
UNION INSULATING CO.
Parkersburg, West Va.



Fluorescent Fixture (32)

A new fluorescent fixture called the "Commonwealth", Series 2800. Overall depth is 3 in.; 60° slope sides, when pointed in loses itself to the ceiling. Constructed from heavy code gauge steel. Corning No. 70 lens used. Ballast in end. Available in 1- to 8-lamp size, with or without opaque light panels at sides. Glass frame swings down for access and maintenance. Surface mounts easily. Recommended for new construction, remodeling or modernizing.

Holdenline Company, 2300 Scranton Road, Cleveland, Ohio.



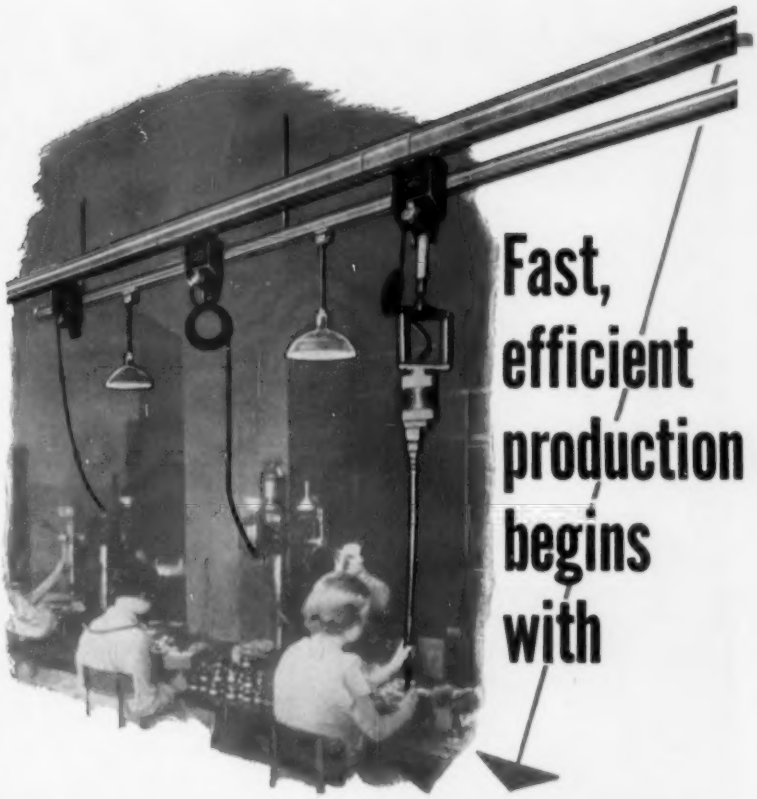
Motors (33)

The variable speed and step-by-step starting features of slip ring motors are now available as standard units in fractional ratings of ¼, ½, ¾ and 1 hp, in small No. 66 frame size. Slip ring motors are used on printing presses, conveyors, ventilating equipment cranes and hoists and other machines that require operator-regulated running speeds. Motors are available with speed selections from 50% to 100% of full load speeds in ratings of 1800 rpm and 1200 rpm.

Reuland Electric Co., Alhambra, Calif.

Motor (34)

A new integral drive fractional horsepower blower motor. The rotating member, or rotor, is on the outside and revolves around a stationary shaft and stator assembly. Lead wires pass through the hollow stationary shaft to the stator windings. Integral drive of the blower wheels is accomplished by a flange on the rotor which connects directly to the wheel. The motor itself is a 6-pole permanent split capacitor type, which



Fast, efficient production begins with

ELECTRIC FEEDRAIL®

That's because FEEDRAIL Trolley Busways over your production, assembly and test lines . . .

- provide mobile outlets for electrical machines and portable tools where they're wanted.
- eliminate long, dragging cables that endanger personnel and hamper their work.
- keep electrification and tools off floor and benches . . . away from the danger zone.
- enable quick tool changes without cutting off power.

Safe, smooth-flowing, time-saving production is the result — *a result you can get in your plant.* FEEDRAIL Trolley Busways are surprisingly easy to install in operating plants as well as new ones. And they're just as readily modified or moved to meet changing production requirements.

When you install FEEDRAIL Trolley Busways you're sure of maximum safety, adaptability and reliability in electrical power distribution.

54-2 Rev

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Subsidiary of Russell & Stoll Company, Inc.
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Please send information on FEEDRAIL TROLLEY BUSWAY Systems for:

☐ Cranes and Hoists ☐ Production Lines
☐ Test Lines ☐ Other Applications (please specify)

Name Title

Firm

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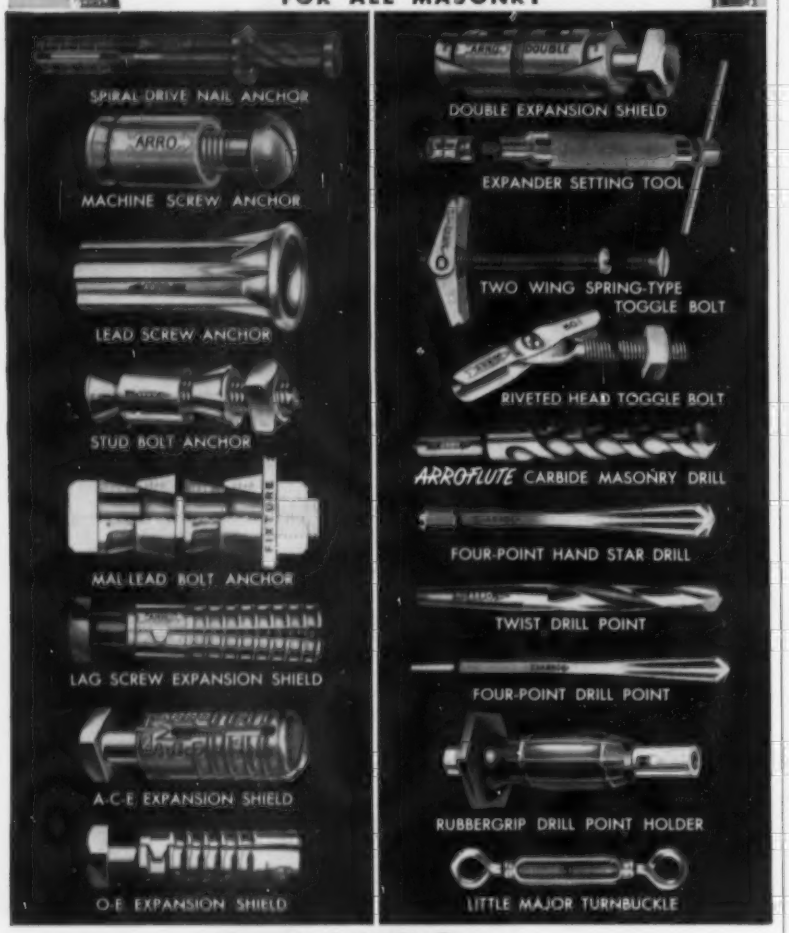
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Eliminate the many problems of inventory control by purchasing your Arro Anchoring and Drilling Devices as needed from your local industrial supplier, wholesale hardware, or electrical supply house.

Always Specify

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COMPLETE LINE
ANCHORING AND DRILLING DEVICES FOR ALL MASONRY



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See your industrial, hardware or electrical supplier

ARRO EXPANSION BOLT COMPANY

1540 Boone Ave., Marion, Ohio

has high electrical efficiency and high power factor. Full load speed is 1050 rpm, but speed can be controlled by varying the voltage. Motor is rated at ½ hp. Weight is 12½ lbs; diameter, 6 in.; width, 4¼ in. It features a new ventilation principle. Fan blades are integrally cast with the end shields, which rotate with the external rotor. Air is drawn into each end of motor through holes near the shaft. Literature is available.

Electronics Division, Iron Fireman Manufacturing Co., 2838 S. E. 9th Ave., Portland 2, Ore.

Plastic Compound (35)

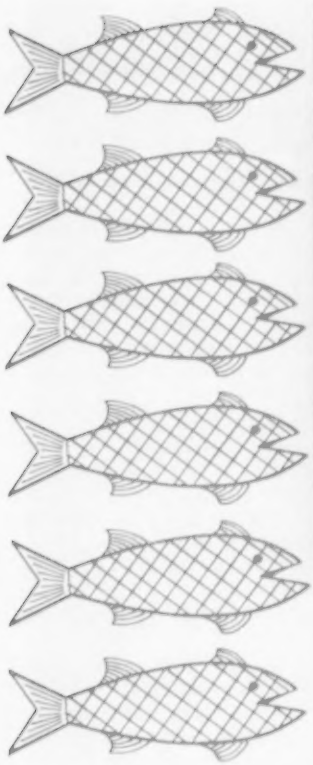
A hard-setting plastic compound has been developed to permit rapid field insulation and weatherproofing of electrical cable splices. Material is also used as an impervious sealant for gas lines. Packaged in a compartmentalized polyethylene container, "Thoxene Clamp-Coat" is ready to use as soon as its two separate components have been thoroughly mixed. By covering the cable splice with the activated formulation and allowing the latter to harden—setting time is from 2½ to 3 hours, depending on the ambient air temperature—a weatherproof, abrasion-resistant coating with high electrical insulation is achieved. Coatings up to ½-in. thick can be applied without dripping off. Hardening starts within minutes after coating is applied, and compound sets firm within a few hours, even if immersed in water.

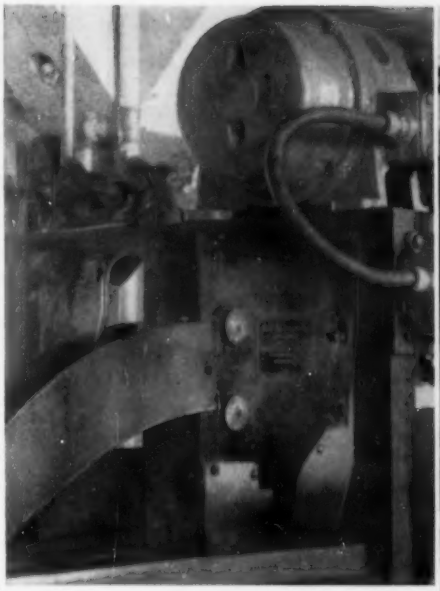
Shell Chemical Corp., 380 Madison Ave., New York 17, N. Y.

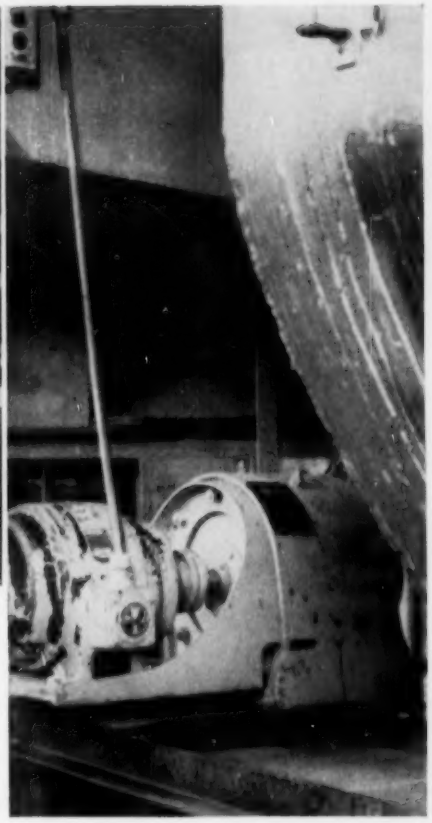
Product Briefs

(36) J. R. Richards Company, Carnegie, Pa., is producing new switch **box holder**; set screw type EMT **fittings**; and "multi-purpose" **supports**. . . . (37) A 24-volt **transformer** for low-voltage controls in domestic, commercial and industrial installations has been introduced by General Controls Co., Glendale, Calif. . . . (38) A new **tachometer** with overspeed and underspeed controls, Series 42X, has been announced by the Metron Instrument Company, Denver, Colo.

(39) A new mobile storage **trailer**, 17 ft long, is being manufactured by the International Trailer Co., Inc., 5712 Erdman Ave., Baltimore 5, Md. . . . (40) The Henry G. Dietz Company, Long Island City, N. Y., has announced the addition of the Cat. No. 110 vacuum static pressure **control** to its line of low pressure switches. . . . (41) Machinery Electrification, Inc., Northboro, Mass., has announced the development of the MEK-3001A electronic liquid level **control** for the general processing industries.







Motors on automatic fish processing line at a Washington cannery, showing flexible leads of tough, water- and oil-resisting TIREX SO Cords that work in a shower of fish cleanings and steam.

TIREX CORDS solve problem of keeping motors running in fish cannery...

Automatic fish processing machines at a Washington cannery take fresh fish at one end of a long table, remove entrails, fins, tails, heads and scales, and deposit meat ready for canning at the other end.

The machines are driven by small motors that work in water and gurry, and that have to be hosed down with live steam.

Water kept getting into the motors and causing them to fail.

The cannery's chief electrician covered the motor cables with three different types of flexible conduits.

None of them kept the motors dry.

He solved his problem this way:

He used TIREX SO Cords with watertight fittings for the motor leads.

Now no water gets into the motors.

TIREX again proved its ability to stand up and "take it", even under constant attack from water, heat and oil.

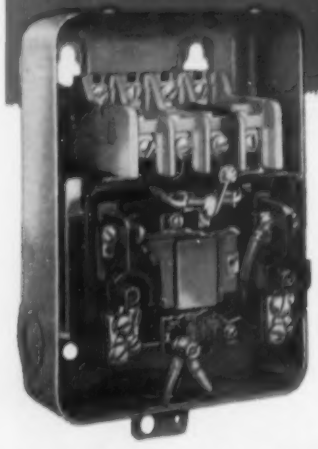
Have you a problem TIREX might solve? If you have, write to the address below.

Simplex-TIREX SO Cords

SIMPLEX WIRE & CABLE CO.
79 Sidney Street, Cambridge 39, Massachusetts

another FURNAS "FIRST"

MAGNETIC MOTOR CONTROLS WITH "DUAL SEAL" COILS



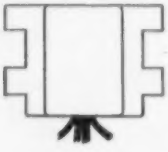


features

- MOISTURE AND FUNGUS RESISTANT
- EXCELLENT HEAT DISSIPATION
- DIMENSIONALLY STABLE
- MECHANICALLY STRONGER
- NON-COMBUSTIBLE

Furnas Electric again leads the field. Now magnetic motor controls are available with Dual Seal coils. Dual Seal coils mean longer control life. Why? Because Dual Seal molded coils are moisture and fungus resistant, eliminating the most common cause for coil failure. These homogeneous molded coils are dimensionally stable, age resistant, will not support combustion and have high dielectric strength. Mechanical properties of Dual Seal coils eliminate damage due to vibration or impact and are impervious to damage by screwdrivers and other hand operated tools. Only Furnas magnetic controls are equipped with Dual Seal coils. Before you buy, investigate the many advantages of these controls. Then specify Furnas Electric.

DUAL VOLTAGE COILS



Furnas Electric magnetic controls with exclusive Dual Seal dual voltage coils are matched for use with your dual voltage motors. Coil changing is now virtually eliminated and stocking of coils and starters simplified. For example, on 3, 7½ and 10 horsepower starters, one 220-440 volt Furnas Electric coil is used where six are normally required. Simple, on-the-job, reconnection of coil leads change high to low or low to high voltage as required.

OTHER FURNAS FIRSTS

- First Drum Controller with built-in thermal overload protection.
- First small Drum Controllers for reversing and speed changing.
- First to build compact, easy to operate Master Switch for wound rotor motors.
- First Tap Switch for single handle control of rectifiers.
- First to use the principle of Switchlets for auxiliary contact on starters.
- First to build a line of in-between sizes of starters.

Write for free 140 page Furnas Electric Catalog 1067 McKee Street, Batavia, Illinois.

FURNAS

FURNAS ELECTRIC COMPANY
BATAVIA, ILLINOIS
SALES REPRESENTATIVES IN ALL PRINCIPAL CITIES

CATALOGS and BULLETINS

(42) INDUSTRIAL FANS providing full-range coverage of industrial air and material handling needs are described in 72-page bulletin 5306. Dimensions, operating capacities, and other selection data on these Series 106 units are given. American Blower Corp.

(43) REMOTE HEATING STATION for use in conjunction with m-g set of 960-, 3000-, or 9600-cycle output in the 30- to 300-kw power range; can be employed for all heat treating processes. Bulletin 1500. Lindberg Engineering Co., HF Heating Div.

(44) BATTERY CHARGER of the diverter pole type for servicing control-bus batteries in main- and substations. Operating in parallel with batteries, the unit holds the charge on batteries and carries the continuous control-bus load. Bulletin 13-200, 4 pages. Electric Products Co.

(45) COMMUNITY TV ANTENNA SYSTEM for areas of poor reception consists of master antenna erected on a mountain top, amplifying equipment and coaxial cable network delivering signals to system subscribers. Physical setup, characteristics and economics of CT are described in a 16-page booklet. Entron Inc.

(46) POWER TOOL. Combination 200-amp welder and 4-kva standby ac power unit is called the Weldanpower. Current for both welding and ac load is available at the same time. Bulletin SB-1339-2, 4 pages, gives ratings, specifications and dimensions. Lincoln Electric Co.

(47) FUSED PLUGS protect appliance and circuit from shorts. Impact resistant plug body accommodates two glass tubular fuses. U.L. approved to 15 amps. One-page sheet gives details and prices. Elmenco Products Co.

(48) INTERCOM SYSTEM called the Dorphone consists of three flush units—one master and two remote. Remote stations are installed at entrances to afford two-way communication between interior master station and callers. 2-page bulletin. Dorphone.

(49) SILICONES. Technical data on almost 150 products is indexed as

NEW! IMPROVED COMPLETE LINE OF RACO

HANDY BOXES AND COVERS

COVER SCREW

Cover mounting screws are assembled and self-retained in covers. Cannot shake out, but easily removed if desired. No fiber washers or extra parts used to retain screws.



Bright Plated Finish on Covers and Boxes

Deeper Cover Neater Appearance

Integral Ears

Uniform Weight One-Piece Box! Corners are full metal thickness smoothly rounded and strong . . . won't crack

Knockouts Easily Removed

Strong Flat Bottom for Easier, Firmer Mounting

OVERLAPPING COVERS FOR EVERY WIRING REQUIREMENT!

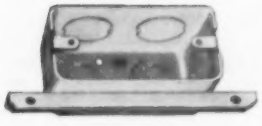


No. 860 Blank | No. 861 ½" Knockout | No. 863 Single Device | No. 864 Duplex | No. 865 Toggle Switch | No. 866 Despard

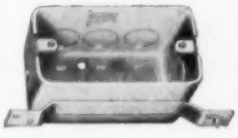
RACO HANDY BOXES ARE ONE PIECE DRAWN STEEL!

Standard Sizes—4" long, 2⅛" wide by 1½", 1⅞" or 2⅛" deep

Available with or without brackets in all sizes

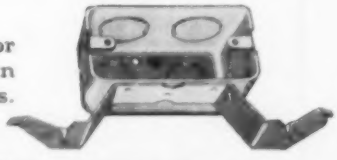


A Bracket, ½" knockouts in 1½" and 1⅞" deep boxes. Either ½" or ¾" knockouts in 2⅛" deep boxes.

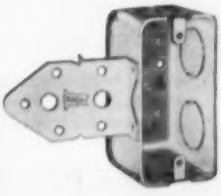


F Bracket, ½" knockouts in 1½" and 1⅞" deep boxes.

O Bracket, ½" or ¾" knockouts in 2⅛" deep boxes.



B Bracket, ½" or ¾" knockouts in 1½" and 2⅛" deep boxes.



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"A RACO BOX FOR EVERY NEED"

ALL-STEEL EQUIPMENT INC. Aurora, Illinois

NOW! A NEWER BEAVER MODEL-D POWER DRIVE



MORE POWERFUL!
MORE ECONOMICAL!
MORE PROFITABLE!
AND HERE'S WHY!

★ Gears fully enclosed. Lubricated for life!

★ Amazing Power-Grip Wrenchless Chuck holds like a bulldog in forward or reverse!

★ Motor easily accessible without dismantling. Well ventilated for greater power, lower upkeep. Drives geared tools up to 12"!

★ Four-legged stability makes Model-D STAY PUT . . . important when using with drive shaft and geared tools!

★ Your choice of 110- or 220-volt universal motor!

★ All parts accessible! Bronze bearings easy to replace in your shop if necessary!

★ Polished aluminum! Weighs only 98 pounds!

Write, Wire or Phone for Information! Ask about the Beaver No. 78 Quick Opening Threader—specially adapted for Power Drive use!

BEAVER
PIPE TOOLS
230-400 DANA AVE. • WARREN, O., U. S. A.
"55 Years of Highest Quality"

to form and cross-indexed as to usage. Included are insulations, lubricants and protective coatings. 12 pages. Dow Corning Corp.

(50) LUMINOUS CEILING SYSTEM features wide range of diffusing media, integrated suspension equipment, and optional acoustical baffles. Components and complete design data are included in 24-page booklet. Columbia Electric & Mfg. Co.

(51) HAND TOOLS. Catalog SD-56, 44 pages, covers an extensive line of screw drivers, pliers and other basic equipment of the mechanic. Vaco Products Co.

(52) ALUMINUM CABLE of the self-supporting aerial type consists of one or three insulated conductors cabled about a messenger. Bulletin OK-1064, 8 pages, gives physical, mechanical and electrical data for all sizes and ratings from 600 volt to 15 kv. Okonite Co.

(54) CONDUIT RACEWAYS are the subject of booklet 18-255, 20 pages, which covers galvanized and black enameled rigid steel conduit, EMT and plastic-coated steel conduits. Specifications and applications are included with extensive data tables. General Electric Co.

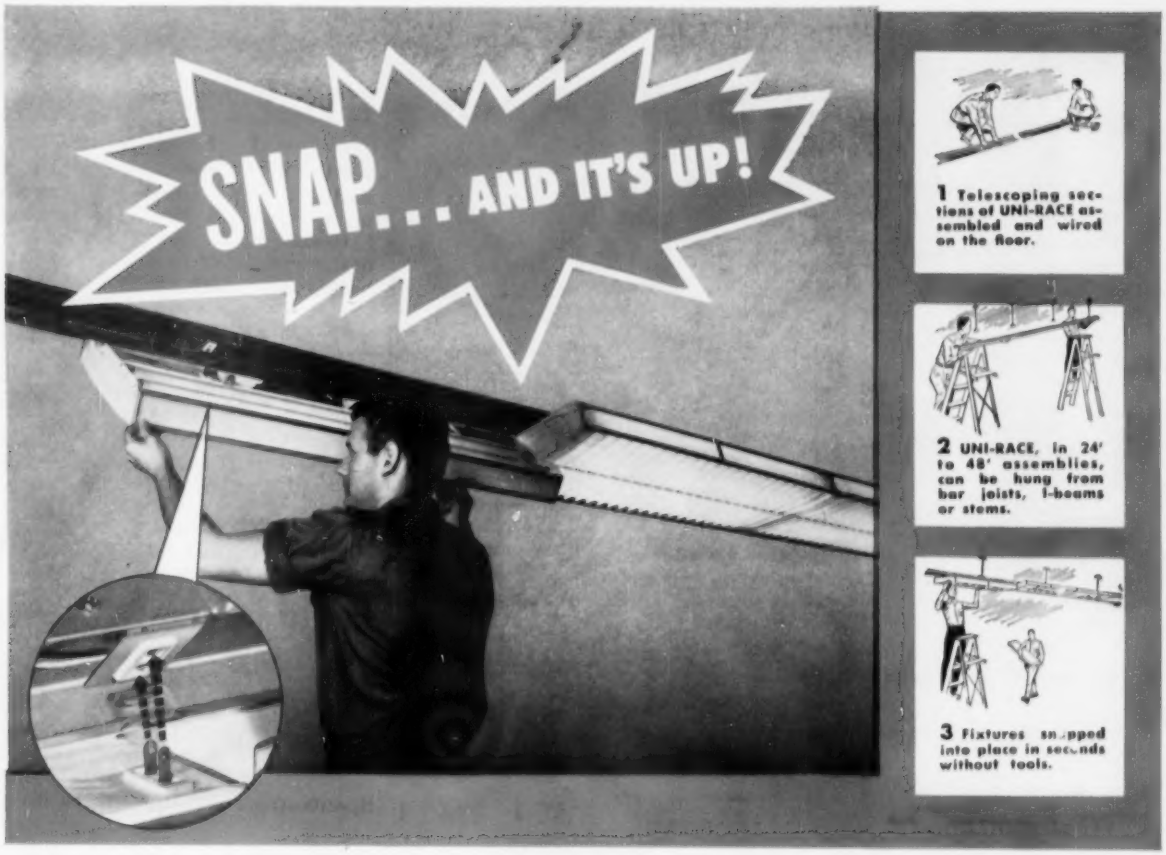
(55) MOTORS of the new open drip-proof type, as well as enclosed and explosion-proof motors are featured in bulletin 1700 describing construction, dimensions and performance test results on this new line of re-rated equipment. Louis Allis Co.

(56) WIREWAYS in the 4 by 4 and 6 by 6 sizes are detailed in 20-page catalog 445. These metal raceways feature a hinged cover for easy access at any point. Components and hanging methods are illustrated. National Electric Products Corp.

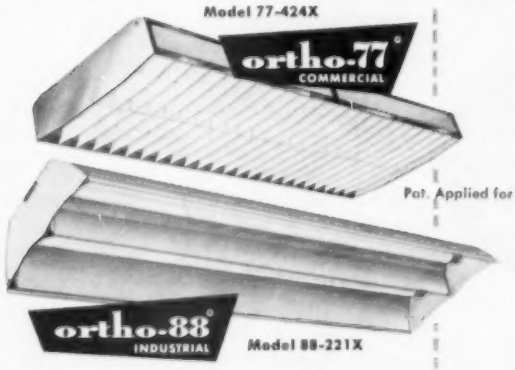
(57) CONTROLS. Reversing and non-reversing line voltage ac magnetic starters are the subject of 8-page bulletin 1020 which covers construction, specifications and applications of all types. Service instructions and parts are listed. RBM Div. Essex Wire Corp.

(58) SOLDER and its proper application are discussed in a new leaflet on soldering techniques and problems. Special section deals with methods of joining aluminum. Anchor Metal Co., Inc.

(59) FANS. Brochure SA-577, 8 pages, describes manufacturer's 1956 line including portable, floor,



HERE'S BETTER LIGHTING AT HALF THE COST



FEATURES THAT DEFY COMPARISON

- **ON-JOB POWER SOURCE** Before fixtures are installed, receptacles in UNI-RACE provide power source for tools and temporary lighting.
- **NO FIXTURE STORAGE** Fixtures need not be delivered until premises are painted. The units can then be snapped into place—clean and factory fresh.
- **VARIABLE SPACING** Fixtures can be mounted in continuous rows or at intervals of 4, 8, 12 or more feet—added, removed or respaced at any time.

The Gibson ORTHO Fixture is a completely new concept in commercial and industrial lighting design. The exclusive UNI-RACE, shipped separately from the fixtures, provides straight alignment, exact fixture spacing and a fixed power source (receptacle) for each fixture. It banishes those pesky aligning problems and eliminates all electrical work on the fixture itself—just take the units as they come from the box and snap into place at any desired interval of 4′ or 8′ on the UNI-RACE.

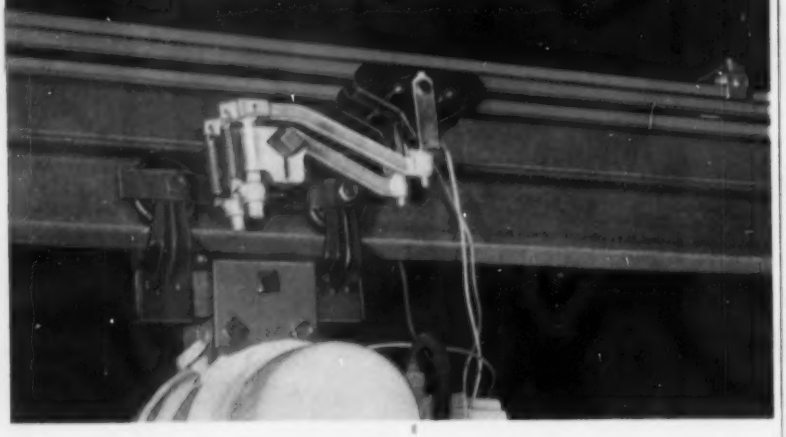
All of which adds up to a 50-percent saving in labor and material—often more—unheard of flexibility to the user, and gives you a better-looking, higher-quality job.

There are many other advantages you ought to know about. Drop us a line today, we'll gladly send you complete information about the remarkable new ORTHO-77 and 88 for commercial and industrial applications.



Add Safety • Cut Costs

WITH INSUL-8-BAR



Mobile Safety Electrification

FOR CRANES, MONORAILS ALL MOVING MACHINERY

Insul-8-Bar guarded conductor systems eliminate the hazards of bare electric conductors. Their cost is relatively low, yet they fully satisfy all safety requirements — legal and otherwise — of modern plant operation.

- *Economical:* simplicity contributes to low purchase price, installation and maintenance costs.
- *Versatile:* conductors can be placed as close as 1¼" centers — side by side, horizontally, or vertically.
- *Flexible:* the systems are designed to negotiate any type of curve, switch, or interlock.
- *Capacities:* the same basic size conductor is available in capacities of 100 Amps. to 500 Amps. without change in accessories or clearances.

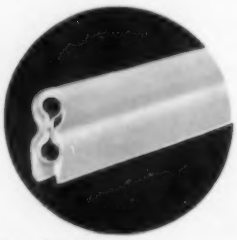
These are the only systems (insulated *or* bare) that meet all requirements of crane, monorail, and moving machine electrification.

For low cost safety, easy installation, and trouble-free performance, specify and use Insul-8-Bar. Write for catalog and technical data.



Collectors

Trolley-type, sliding shoe collectors are available in capacities and mountings to meet all requirements. There are no exposed current carrying surfaces.



Conductors

Plastic "Geon" sheath covers the 1" figure 8 conductor bar. Cover is not affected by moisture, sunlight or chemical agent. It meets all requirements for thermoplastic electrical insulation. Although rigid, it may be curved on the conductor bar at time of field installation.

INSUL 8 BAR

INSUL-8-CORP.

1369 Industrial Road
San Carlos, California
Representatives in all major cities.

attic, and industrial models. Dayton Electric Mfg. Co.

(60) BRUSHES. New general purpose industrial motor and generator brush provides smooth, trouble-free operation and optimum commutation, high performance characteristics where heavy load-swings exist. N-4 Brush booklet, 8 pages, gives extensive technical data including in-service reports of various applications. National Carbon Co.

(61) INSULATION. Booklet MB-4, 8 pages, describes physical and electrical properties of "Mylar" polyester film and its recent applications in the electrical industry. DuPont Film Dept.

(62) FACTORY LIGHTING is discussed in 6-page folder 600E on A.L.S. fluorescent units. Layout information and performance characteristics afford all necessary data for planning. Cost table compares these units with other industrial types. Smithcraft Lighting Div.

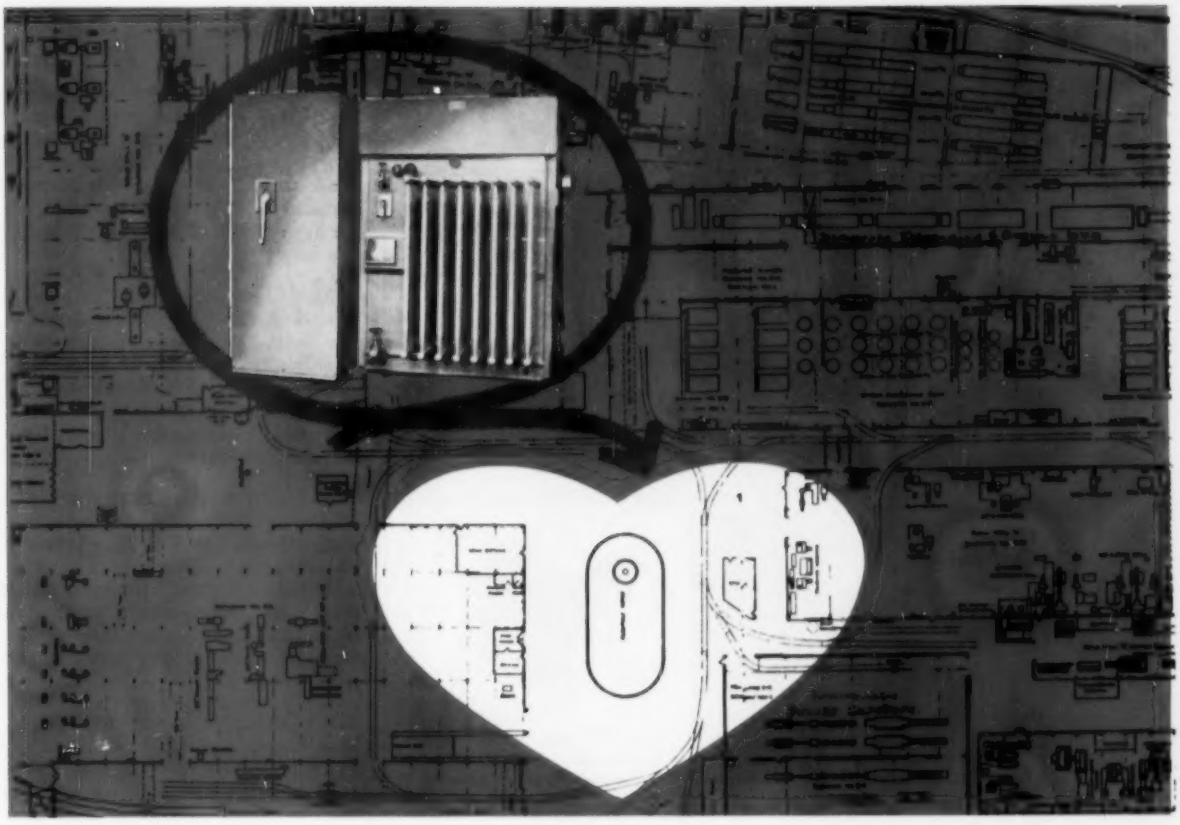
(63) VIBRATION MOUNTINGS for industrial machines are detailed in booklet SS-55. Construction features and rated load in pounds of these steel spring mounts is given. T. R. Finn & Co., Inc.

(64) STEEL FRAMING may be employed for racks, combined wiring channel and fixture support, and many other applications. StoRack catalog, 8 pages, covers sizes, dimensions, fittings, engineering data and uses. American Steel and Iron Works.

(65) LUMINAIRES. Schedules 1155 and 1155DN give list and trade pricing of line of fluorescent and concentric ring units and components. H. E. Williams Products Co.

(66) CONTROLS. Two brochures. Low voltage switchgear using air CB's in ratings to 3,000 amps is described in 16-page booklet 722. Fused motor starter for 2200- to 4800-volt squirrel cage and synchronous motors affords "maximum service and safety for minimum cost". Bulletin 1041, 8 pages. Nelson Electric Mfg. Co.

(67) BUS DISTRIBUTION SYSTEM. Low-impedance feeder busway employing either copper or aluminum bus is available in ratings of 600 to 4000 amps in two-, three-, or four-pole style. GEA-6151, 16 pages gives complete construction and design specifications. General Elec-



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an UPTEGRAFF LOAD CENTER TRANSFORMER

reduces costs...improves power characteristics

Uptegraff announces a complete line of *Liquid Filled* LOAD CENTER TRANSFORMERS—150 KVA to 2500 KVA, 3 phase—designed for convenient installation with various types of switching equipment and terminal arrangements.

The use of Uptegraff Load Center Transformers offers savings up to 15 per cent as compared to the practice of using remote outdoor transformers to supply low-voltage power to machines and equipment located indoors. With load center transformers, costly low-voltage runs are kept to the minimum, and power characteristics are improved.

Uptegraff Load Center Transformers are designed and built specifically for this class of service. In addition to savings in installation costs, they offer substantial economies through operating efficiency. They are dependable and require the minimum of maintenance.

R. E. Uptegraff Manufacturing Co.

Scottdale, Pennsylvania

NEW HANDBOOK



The new Uptegraff Load Center Transformer Handbook simplifies the selection of a suitable unit, including auxiliary terminal equipment to provide the facilities you require. It gives overall dimensions and weights (including terminal devices, etc.) for all ratings from 150 to 2500 KVA,—3 phase. Write for a free copy. The coupon below is included for your convenience.

R. E. Uptegraff Manufacturing Company
Scottdale, Pennsylvania

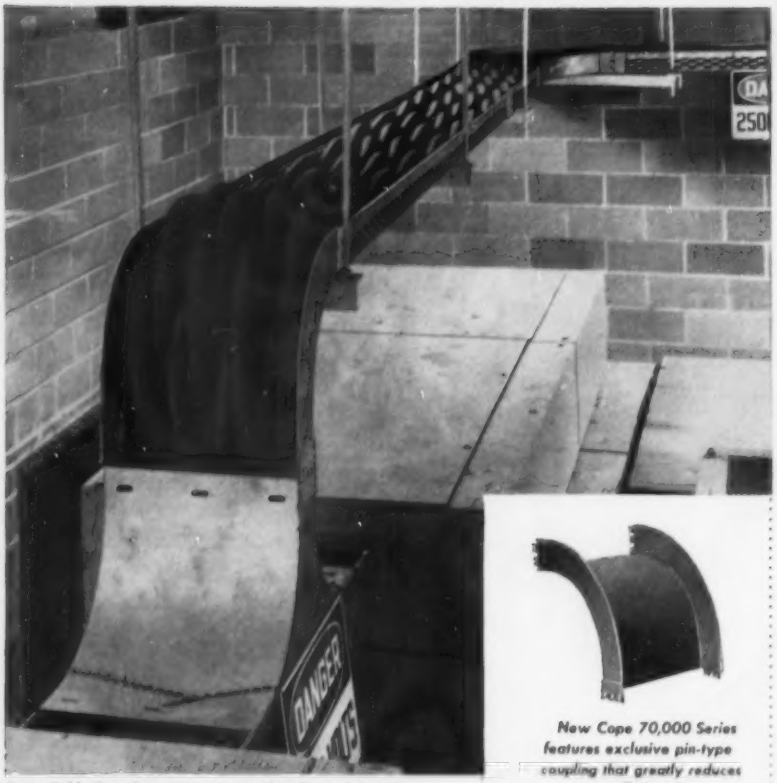
Please send a copy of your LOAD CENTER TRANSFORMER brochure, Catalog 132, to:

Name _____ Position _____

Company _____

Address _____

ECM-1



Cope Cable Trough carrying 4 sets of 3 phase triplexed cable carrying 2300 volts with a free-air rating.
Scott Paper Company, Everett, Washington.

New Cope 70,000 Series features exclusive pin-type coupling that greatly reduces installation time.

2300 VOLTS
and No Need for Conduit

More and more engineers and contractors are adopting Cope cable trough. The great advantages of cable trough include:

- Savings of materials
- Savings in installation time
- Savings in installation costs
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- Ease of expansion
- Flexibility in awkward spaces
- Accessibility for inspection

Our engineers are ready to work with you. Write us today for full details on new 70,000 Series.

T. J. COPE, INC.
711 SOUTH FIFTIETH STREET, PHILADELPHIA 43, PENNA.

Cope

GROUND TENTS | ROD GRAPPLES | CABLE REEL JACKS | WARNING SIGNS | CROSS ARM SHEAVES

tric Co., Distribution Assemblies Dept.

(68) TEST EQUIPMENT for over potential testing and power supply use, along with meters, transformers phase sequence indicators and other devices are listed in 20-page catalog 55G-U which includes extensive technical data on all units. Davenport Mfg. Co.

(69) INSULATED CABLES with ozone-, moisture-, and heat-resisting butyl-base insulation are thoroughly described in 48-page Keystone catalog. Test results and extensive technical data on power and control cables are given. Hazard Div. of Okonite Co.

(70) CONTROL MAINTENANCE. Comprehensive program to maintain peak efficiency in V*S Jr. electronic variable-speed drives is discussed in bulletin H-2104. Renewal parts kits and replacement exchange panels availability are covered. Reliance Electric & Engineering Co.

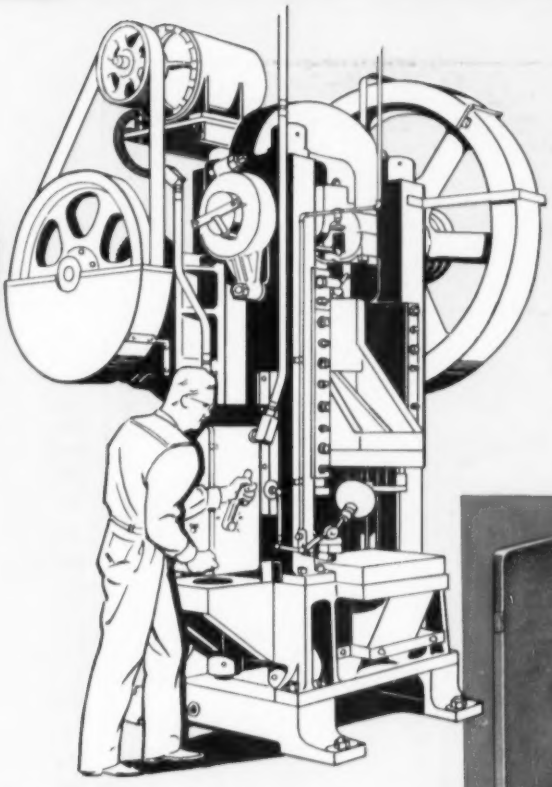
(71) TRANSFORMERS AND BALLASTS. Two bulletins. GED-2767, 32 pages, lists control transformers such as autotransformers, machine tool transformers, and special application models; complete technical data. Bulletin GEC-983G, 12 pages, covers manufacturer's complete line of fluorescent lamp ballasts, including those for plastic signs and outdoor applications, circline lamps and dc operation. General Electric Co.

(72) PANELBOARD catalog 3-205 includes a 55-page listing of fusible and circuit breaker panels for distribution and lighting applications. Also a 20-page technical data section covering Code and U.L. requirements, transformer connections for distribution voltages, and circuit breaker characteristics. Federal Pacific Electric Co.

(73) OUTDOOR FLUORESCENT LUMINAIRE for use as a coping light. These extruded aluminum fixtures will withstand heavy storm conditions. Coping-Lites are available in lengths up to 16 ft and employ only 800-ma rapid start lamps. Also, island units in lengths to 24 ft for either slimline or rapid start lamps. 8-page catalog. Magni Flood Inc.

(74) FHP MOTORS for dc applications are described in 12-page catalog GEA-6068 which covers typical uses and outstanding design features plus facilities for producing special models. General Electric Co.

The Sign of
QUALITY
Motor Control



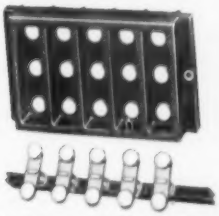
Bliss No. 207 Press in the plant of V. W. Danielson Manufacturing Co. It is started with an Allen-Bradley Bulletin 646 manual autotransformer starter, as shown below, with cabinet open to show air-break contacts and reduced voltage transformer.



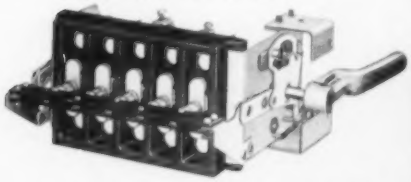
BULLETIN 646

MANUAL AUTOTRANSFORMER STARTERS with AIR-BREAK CONTACTS up to 75 HP, 220 V; 150 HP, 440-550 V.

Stationary and Moving Contacts of Bulletin 646 Reduced Voltage Autotransformer Starter



Cadmium silver stationary contacts are mounted in the arc hood and the moving contacts are on the crossbar.



Simple switching mechanism which first connects motor to reduced voltage taps and then shifts it to full line voltage.

Freedom from messy, oil-immersed starter contacts and oil tanks . . . that's the outstanding advantage of Allen-Bradley Bulletin 646 autotransformer starters up to 75 hp, 220 v; 150 hp, 440-550 v. This range covers most squirrel cage motors. The air-break, cadmium silver contacts need no maintenance.

The starting lever is so interlocked that the operator must pull the lever FIRST to the START position. After a preset, adjustable interval, a bell rings to indicate when the lever should be pushed into the RUN position. The starter is held in the RUN position by a magnetic latch, which drops out and stops the motor in case of overload or line failure.

In flour mills, grain elevators, and other places with explosive dust hazards, oil-immersed contacts must of necessity be used. For such applications an oil tank and copper-to-copper contacts can be supplied. Write for Bulletin 646.

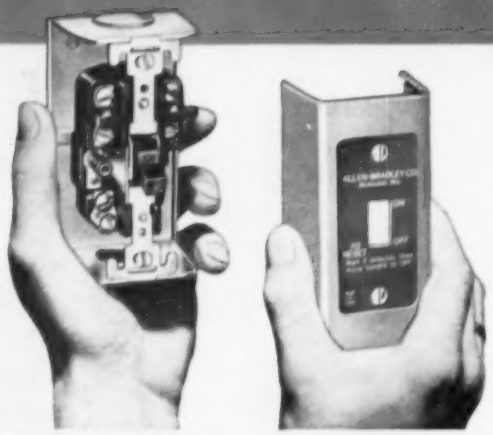
Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Ltd., Galt, Ont.

2-56-M

ALLEN-BRADLEY
MOTOR CONTROL
QUALITY

SMALL MOTORS
need overload protection too!

BULLETIN 600 STARTING SWITCH





Because

SMALL MOTORS CAN BE AS IMPORTANT TO PRODUCTION SCHEDULES AS LARGE MOTORS

Here is an outstandingly popular starter for applications using motors of ONE HORSEPOWER OR LESS.

It is a small, manually operated starter that is equipped with a time-tested, reliable A-B overload breaker. A soldered ratchet trips the operating lever in case of a sustained overload. It is reset, after tripping, merely by moving the operating lever to the OFF position. Overload heater elements are available to cover the ratings of this starter.

The Bulletin 600 starting switch is available in single and double pole construction. Its double break, silver alloy contacts provide high interrupting capacity. The contacts are always in good operating condition. They never need to be cleaned, filed or dressed. Please write for a copy of Bulletin 600 for complete information on the Bulletin 600 line.

SIMPLE DESIGN



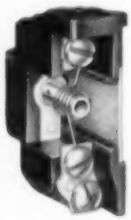
Simple ON & OFF snap switch . . . easy access to terminals . . . ample wiring space . . . silver alloy contacts need no cleaning or maintenance.

ATTRACTIVE APPEARANCE



Streamlined enclosure in grey enamel, and bonderized to assure positive binding of enamel finish to resist corrosion. The pilot light is optional.

OVERLOAD BREAKER



According to National Elec. Code ruling, motors of 1 hp or less, automatically started by thermostat, float switch, etc. must have overload protection.

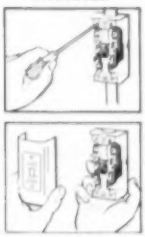
FITS STANDARD SWITCH BOXES



Bulletin 600 starters fit any standard 2½ in. deep wall switch box.

Can be mounted in machine frame or base. Available with pilot light.

EASY TO INSTALL



Remove 2 screws on front of starter . . . slip off cover . . . attach conduit . . . pull in wires and connect to terminals . . . replace the cover.

VARIETY OF ENCLOSURES



Type 7 for hazardous locations.



Type 4 watertight.



Type 4 with pilot light.

Allen-Bradley Co.
1316 S. Second St.
Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Ltd., Galt, Ont.

A-B Quality

ALLEN-BRADLEY

BULLETIN 600 STARTING SWITCHES

QUALITY

2-56-MR

(75) TRANSFORMERS. Bulletin 136, 16 pages, presents performance data, ratings and dimensions on standard station-type distribution transformers in the range of 150 kva to 500 kva. Units are single or 3-phase, oil- or askarel-filled. Useful information on terminal details, testing and inspection practices, and accessories is included. R. E. Uptegraff Mfg. Co.

(76) WELDER, in 300-, 400- and 500-amp ac ratings, is available with integral dc rectifier. Features are: arc selector control that permits operator to obtain any of four different arcs; fixed current output; and foolproof hook-up switch for connecting to 220- or 440-volt lines. Bulletin 1343-25M, 8 pages. Lincoln Electric Co.

(77) SWITCHES, lampholders and lamp guards are the major headings of 52-page Catalog 84 covering wall, lamp and appliance switches and hundreds of wiring accessories. McGill Manufacturing Co., Inc.

(78) TROFFERS. Newly designed 1- and 2-ft wide troffers featuring patented yoke-aligner hanger are detailed in 36-page Form 430C. Installation data for various types of ceilings and photometric tables for various units and available shielding equipment are given. Smithcraft Lighting Division.

(79) CONTROLS for a variety of heating, refrigeration, air conditioning and industrial applications are described in Catalog 856, 52 pages. Devices feature sealed mercury contact switches which afford long-lasting, corrosion proof contacts. Mercoid Corp.

(80) ROTARY SWITCHES for operating meter instruments, various regulatory functions and for controlling such electrical equipment as circuit breakers, transformer tap changers and motor-operated rheostats are described in 8-page Bulletin 14B8112. The flexibility, accessibility and dependability of these type 210 devices is demonstrated by analysis of construction and operation. Allis-Chalmers Mfg. Co.

(81) MASONRY DRILLS. Two models are described in Bulletin A-111, 4 pages. Model E uses diamond set core drill bits for cutting holes up to 6½-in. in diameter, may be used at any angle. Smaller model ER has a maximum cutting size of 3¼-in. and is designed for vertical drilling. Pennsylvania Drilling Co.

New Books and Films

Electrical Estimating

The second edition of this well-known volume features a new section on labor units plus over 500 sell price units. Other material covered includes sample estimates, checking methods, ways to figure markups and useful pointers on appraising, cost accounting and job scheduling. By Ray Ashley. 2nd Edition. McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. 363 pages. $8.00.

How to Decorate and Light Your Home

This joint effort of a top-flight interior decorator and a home lighting expert covers selection of decorating theme and colors, arrangements of furniture and other aspects of home planning. Basic concept is that lighting is a basic element of interior design. Suggestion for integrating lighting with the color and atmosphere of various living areas will be particularly useful to the electrical man. By E. W. Commery and C. Eugene Stephenson. Coward-McCann, Inc., 210 Madison Ave., New York, N. Y. 256 pages. $6.75.

Accident Prevention Manual for Industrial Operations

The third edition of this standard text contains 17 new sections on specific types of industrial work hazards including conveyors, portable power tools, machine tools, welding and electrical and inflammable liquids. National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill. 1341 pages. $13.50.

Cable . . . Pathway to Power Cable Makers

The first of these two 16mm sound and color motion pictures describes the facilities and processes employed in producing cable. The second film, 21 minutes long, covers a similar story but from the standpoint of the various people who contribute to the production of cable. Available on free loan basis from Rome Cable Corp., Rome, N. Y.

Progress Report on GE Mica Mat

Color slide and sound presentation describes early use of mica for electrical insulation and the development of mica mat. Production methods and applications are also shown and discussed. General Electric Co., Laminated and Insulating Products Dept. Section NR-1, Coshocton, Ohio.

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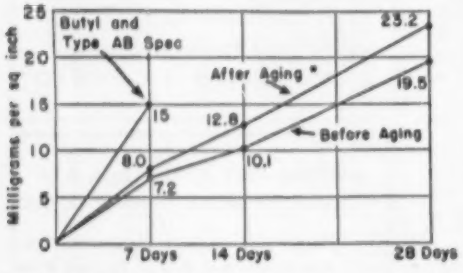


Amazing moisture resistance of Anaconda's Type AB butyl high-voltage insulation helps reduce failure due to moisture.

When you can't keep cable out of moisture

New insulation keeps moisture out of cable

Exceptional moisture resistance is provided by Anaconda Type AB butyl insulation.



RESULTS OF mechanical moisture absorption test show Type AB retains good moisture resistance even after aging.

Where rubber-type cable is installed in underground ducts or buried directly in the earth, the moisture-resistance properties of the *insulation* are vitally important.

Latest facts show *Anaconda's Type AB butyl high-voltage insulation absorbs far less moisture* than industry standards permit. For the mechanical moisture absorption test, the industry has regarded 15 milligrams increase in weight per square inch of exposed surface, after 7 days' immersion at 70C, as a criterion for satisfactory moisture resistance. Type AB easily meets that requirement – in fact, typical results show it absorbs less than 7.2 mg. in 7 days.

New Engineering Bulletin EB-27 gives you full details on performance of Type AB insulation in 15 Industry Specification tests. Ask the Man from Anaconda for your copy. Or write: Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

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ASK THE MAN FROM ANACONDA®

–PIONEER IN BUTYL INSULATION

Reader's Quiz

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published we pay $5.00.

Magnesium Rods in Corrosion Control

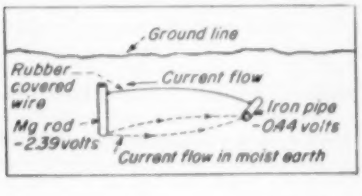
QUESTION J29—Has magnesium been used to prevent rust and corrosion of electrical conduits and cables buried in the ground or used in wet and damp locations? What method has been used successfully in using magnesium?—E.B.

ANSWER TO J29 — Magnesium electrodes have been used to protect buried pipe and conduit, and are quite successful, as long as the electrodes last. The electrodes, cylindrical in shape and weighing 50 lbs each are manufactured specifically for such purposes by a leading chemical company. The pipe is connected at intervals to the electrodes, which are buried alongside the pipe but not touching it. The magnesium then becomes positive with respect to the pipe, and the resulting small flow of current to the pipe deposits a calcareous coating on the pipe which protects it. At the same time the magnesium is consumed by electrolytic action, so it must be replaced at intervals, these time intervals depending on how corrosive the soil moisture is.

In some cases where the moisture is strongly saline, the connection from pipe to electrode is made through an adjustable resistor, to limit the current and the resulting rate of decomposition of the electrode. It is apparent that this is an expensive procedure, so it should be carefully weighed against other more permanent or simpler methods, such as clay back-fill around the pipe, or bituminous enamel coating on the pipe.—E.A.M.

ANSWER TO J29 — Magnesium has been used to prevent corrosion of buried metals as indicated in the following sketch.

Due to the difference in the potential of the two elements in the electromotive series, the moist earth forms an electrolyte and a battery of about 1.5 to 1.75 volts is formed. If this potential is enough to prevent stray currents from leaving the metal to be protected, it will not corrode. The exact application of this cathodic protection depends on many variables such as the ph (acidity) of the soil, resistivity of the soil, and the source and magnitude of the currents that cause the corrosion. The same protection can be obtained by applying a source of direct current between the metal to be protected and a piece of scrap metal (which becomes a sacrifice anode).



Since the application of this type of protection involves so many variables, it is almost necessary to engage a firm of consulting engineers to design a system of protection using magnesium rods or applied direct current as indicated during their research of your specific problem. Often an application of a protective coating of paint or asphaltum is the most feasible protection. Conduits and cables in moist locations cannot be protected by this method as there is no moist earth or similar substance to provide a path through which the current may flow. In our work we try to use non-metallic conduits and polychloroprene jacketed cables as much as possible to eliminate corrosion problems.—R.E.

Load Balance and Open-Delta Hookup

QUESTION K29—When using an open-delta hook-up to feed a unity power factor load (incandescent lamps only); is it correct to figure that the load on the transformers themselves is unity or will the power factor always be approximately 85%? Is there any voltage unbalance if it feeds a balanced load? Does this unbalance in voltage become greater with an increase in load from no-load to full-load?—M.D.

ANSWER TO K29—In the case of the unity power factor load of incandescent lamps the current will be in phase with the voltage but the power factor of the transformer will be approximately 0.85.

To be exact, the current of the transformer will be 30 degrees out of phase making the power factor 0.866.

There is inherently lower voltage across the open phase due to the impedance drop as the current must pass through the impedance of the other two phases.

At no load the power factor is very low because magnetizing current is all that is being supplied. In this case the voltage across the open phase is approximately the same as across the other two phases. As the load is increased the impedance of the two phases increases and causes a greater unbalance of voltages.

A method of employing two transformers in 3-phase transformation which practically overcomes the disadvantages of the "V" connection is found in the "T" connection.

One transformer is connected across two of the line wires while the other is joined between the third line wire and the middle point of the first transformer. The transformer that is tapped to the middle point of the other transformer should be built to deliver 86.6% voltage of the other transformer to obtain equal voltages on all phases.

However, to use two standard transformers of the same voltage will improve the performance over the "V" connection.—B.A.S.

ANSWER TO K29 — At unity power factor load, the current and voltage within each transformer of an open delta bank will be 30° out of phase, resulting in 86.6% power factor on each transformer. Each transformer must carry the full component of its own phase current—plus a component of the line current which would have been contributed by the missing transformer.

At unity power factor in a balanced load, both transformers will carry equal watts load. As load power factor decreases, but if still balanced, each transformer will carry the same current but will have unequal watts output.

Due to the internal impedance

SIMPLEST, SAFEST

IDEAL

CRIMP CONNECTORS

with the "Wrap-Cap"*

THE UNIQUE DIAPER-WRAP INSULATOR



ONLY 2 PARTS



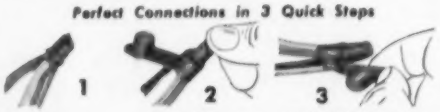
Both the cadmium plated steel sleeve and the "Wrap-Cap" Insulator are listed by Underwriters Laboratories, Inc. for general use, (600 V) in branch circuit and fixture wiring.

*Patented, No. RE23649 and other patents pending.

Anyone who can use a pliers can make a perfect wire joint every time with the IDEAL Crimp Connector! The whole operation takes just seconds!

Stronger, better insulated and easier to use, IDEAL Crimp Connectors give you perfect, pre-fabricated insulation all around the joint and between the wires, with a puncture-proof cap and *double thickness* over the wire ends, *plus* a deep skirt that completely covers the bare conductor even when wires are not stripped evenly.

Perfect Connections in 3 Quick Steps



1 Crimp sleeve with IDEAL Electricians pliers.

2 Push "Wrap-Cap" down over sleeve.

3 Pull tabbed cap between wires and over end of joint.

NO EXTRA TOOL NEEDED!



IDEAL All-Purpose ELECTRICIANS PLIERS

Crimp the Sleeve, Twist the Wire Burr the Conduit

A tool so good you'd want it even without the IDEAL Crimp Connector! Built for all around electrical use. Plastic covering on handles give comfortable grip.

(Patent Pending)

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In Canada: Irving Smith, Ltd., Montreal

IDEAL

IDEAL INDUSTRIES, INC.
1041 Park Avenue, Sycamore, Illinois

Please send catalog data on the new IDEAL Crimp Connector, "Wrap-Cap" Insulator and Electricians Pliers.

Name_____

Company_____

Address_____

City_____ Zone_____ State_____

drops in the transformers, some unbalanced voltages will result. In ordinary commercial circuits, this is not considered serious but does increase with increasing load, and gets worse as the load becomes unbalanced.—L.E.B.

Fan Motor vs Blade Size

QUESTION L29 — In the stock room of our maintenance department we keep several fan blades of different sizes and there are no records, as to where and on what size motor they were once applied. In order to have them properly reinstalled, whenever required, I should like to know whether there is a simple method of calculating the most efficient size and pitch of a fan blade for a given size of electrical motor.—O.P.

ANSWER TO L29—It probably would be possible to calculate which blade went on which motor, but it would be a cumbersome job to measure the pitch and diameter of each blade and then compute the required horsepower.

A far simpler method would be to select a small motor and mount each blade on it in turn for a test run. Measure the input power in watts, convert it to horsepower and you will have a good idea of the motor size required to drive that particular blade. Naturally the test motor will have to be powerful enough to drive the largest blade, yet small enough to be at least fifty per cent loaded with the smallest blade, or the accuracy of the test will be poor. If the selection of blades is large, several motors of different sizes may be needed.

Remember, too, that this power requirement is good only at the speed of the test motor, so it may be well to check blades at several speeds. Should a fan make excessive noise, it is probably designed for a slower motor. Or should the air delivery seem poor, try it at the next higher standard motor speed.

Don't forget to tag all blades with the speed or speeds at which it worked best, and the driving horsepower. Then it wil be a simple matter to choose the right blade for the job.—D.H.N.

ANSWER TO L29—Attach the blades to a motor, and check the load with a wattmeter to see if the motor is too large or too small. Use

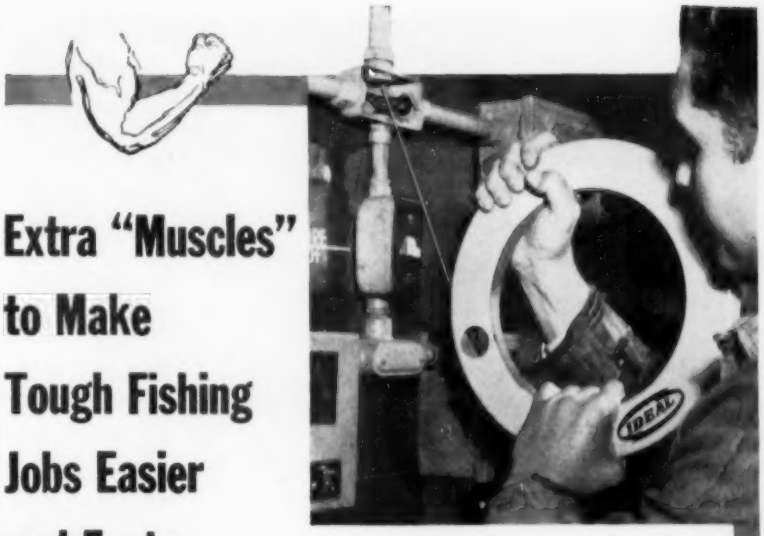
a speed indicator to indicate the speed of the fan at the wattmeter reading. A higher speed will use a larger motor, produce more volume, and more noise. Caution: Fan blades that are out of balance can fly apart at high speeds, so make the test at a spot where no harm can be done, or start the fan blades at extra slow speeds to check the dynamic balance.—H.S.

Voltage of Motors And Power Factor

QUESTION M29—Will we have a better power factor by replacing our lightly loaded 2400-volt motors with 440-volt motors fed by step-down transformers?—L.W.F.

ANSWER TO M29—In general, standard three phase induction motors designed for either 440 or 2300 volts will have about the same power factor for each horsepower rating. If there is any difference in power factor, the 2300-volt motor would generally be slightly higher. Also a transformer because of its draw of magnetizing current will tend to lower the plant power factor slightly. Since power factor of motors decreases very fast as load of motor decreases, the best way to overcome this low power factor condition would be to reduce motor size when possible so motors would operate at more nearly full load. To get best power factor in a plant one method is to connect sufficient kvar rating of capacitors on the load side of the motor controller to raise the no-load power factor of the motor to unity. That would be the maximum amount of kvar which it is safe to add in order to avoid overvoltage from motor self-excitation and to prevent excessive transient torque on motor. With this amount of capacitors added the full load power factor of the motor would generally be from 95% to 98%. If large motors are involved plant power factor can sometimes be most easily improved by using either unity or loading power-factor synchronous motors.—G.L.L.

ANSWER TO M29—Not necessarily. Lightly loaded motors of any voltage will have low power factor, so unless you intend to match the new motor capacity to the actual load there will be no power factor improvement. And by going to a lower voltage you'll increase distribution losses. This might overbalance the power factor



Extra "Muscles" to Make Tough Fishing Jobs Easier and Faster

IDEAL

FISH TAPE, REEL and PULLER

Standby of electricians for close to a generation, IDEAL Fish Tape, Reels and Pullers can help you do any wiring job faster and easier. They're like an extra arm or bigger muscles—make pulling easier and safer. The reel gives you the leverage you need — and keeps the tape always in the reel or conduit. The tape can't spring loose into moving machinery or "hot" lines.

You reel in and pull the tape through conduit in one easy operation . . . no skinned fingers —no cuts—and no lost time! The tape never gets snarled.

Saves work—saves time—saves money! The IDEAL Fish Tape Reel and Puller costs so little you can't afford to be without it! 50 to 200 foot lengths—all tapes are of finest grade, oil tempered flat spring steel.

Now Step Up the Performance of Your IDEAL Fish Tape, Reel and Puller with the

NEW IDEAL FISH TAPE WINDER



Makes IDEAL Fish Tape Reel Even More Useful

Reduces still further the work of fish tape pulling when used with an IDEAL Fish Tape Reel. As Winder is pulled around Reel it spreads the Reel housing so that the tape can be reeled in or out with least effort. Double rollers hold Winder in place as handle is rotated. Three sizes for all IDEAL Reels.

SOLD THROUGH AMERICA'S LEADING DISTRIBUTORS
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1041 Park Avenue, Sycamore, Illinois
Please send catalog data on IDEAL Fish Tapes, Reels and Pullers and Fish Tape Winders.
Name_____
Address_____
Company_____
City_____ Zone____ State_____

IDEAL



improvement. Since you already have the 2300-volt equipment, which I assume is in good condition, it would probably be more economical to try other means of correcting your power factor. Probably the least expensive method would be to install capacitors on your distribution circuits. Or, if you need several new motors, make one of them synchronous and by properly regulating the field current you'll get both power factor correction and useful horsepower from the same device. Your local utility would like to see your power factor improved, too, and they'll be glad to help select the best method to suit your plant.—D.H.N.

Can You ANSWER these QUESTIONS?

QUESTION V29— A 3-phase transformer (75 kva-440 primary) is energized by a contactor in the primary to control furnace temperature. I believe high inrush magnetizing currents are the cause of lamp flicker on other parts of our 1200 kva distribution system. How can the effects of high inrush currents be minimized?—G.F.

QUESTION W29—Please distinguish between a potential circuit and a current circuit as used in control work. Why must current circuits be short-circuited and what process is used to de-magnetize a current transformer that has been accidentally opened?—J.B.K.

QUESTION X29— A chain hoist is 15 tons, hand powered, with movement of approximately 70 ft. The power head is a 9 to 1 gear box which will turn the endless chain of the hoist. Should the motor to power the gear box be a variable speed, constant hp or meet some other requirement? Is there a rectifier on the market so that a dc motor could be used from the ac current available on the site?—E.S.H.

QUESTION Y29— Which gives the most light, a 48-in. starter type fluorescent lamp or a 48-in. instant start slimline? Which is the most economical, all factors considered?—D.H.N.

PLEASE SEND IN YOUR ANSWERS BY MARCH 15

SOME OF THE MANY INDUSTRIES
USING G-E CAPACITORS

Candid Questions and Answers:

the economics of raising power factor with capacitors

Q. What is the significance of power factor ("P.F.")?

A. Power factor is the numerical ratio of kilowatts (working power) to kva (apparent power) expressed as a per cent. Thus, it is a guide to efficient and complete utilization of electric power.

Q. What is the advantage of raising plant power factor?

A. There are two main advantages: 1. Raising P.F. significantly reduces power costs if the power contract contains a P.F. clause. 2. Raising P.F. releases additional plant system capacity permitting expansion of present facilities.

Q. How high should power factor be raised?

A. While each system should be analyzed individually, a wise goal is at least 90 to 95% power factor.

Q. How do capacitors improve power factor?

A. By furnishing magnetizing current (kilovars) for inductive equipment (motors, transformers, etc.), thus allowing additional kilowatts to flow through the plant system.

Q. Are capacitors economical?

A. Absolutely. One West Coast lumber company installed $4400 worth of capacitors in 1939. They estimate their annual power bill savings at $2630 or $44,710 in 17 years. Other capacitor installations have "paid for themselves" in 6 months.

Q. What size and type plant can justify capacitors?

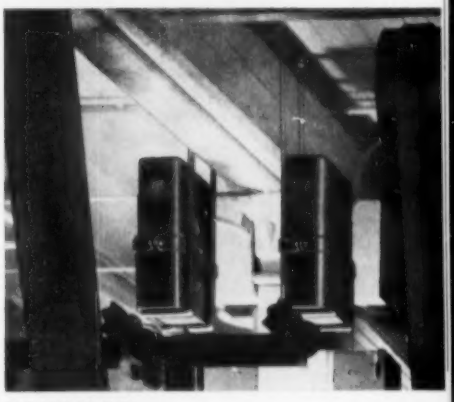
A. Any plant having induction motors and other low power-factor equipment.

Q. Are there other advantages of raising power factor with capacitors?

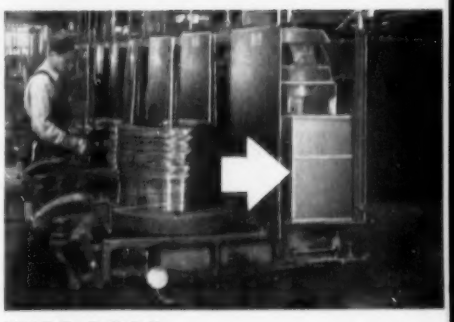
A. Yes, but they are too numerous to mention in this limited space. Let us send you a copy of the helpful bulletin, GEA-5632, "How to Use Capacitors." Just contact your G-E Apparatus Sales Office or write to the General Electric Company, Section B441-111, Schenectady 5, New York.

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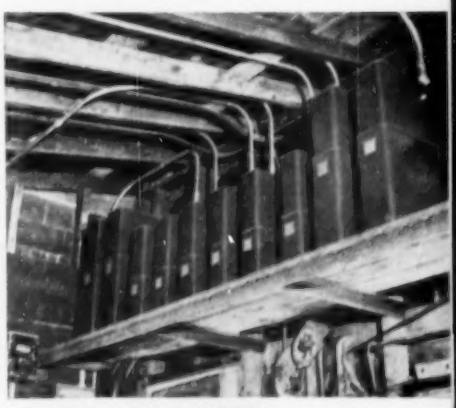
TEXTILES



WIRE ROPE

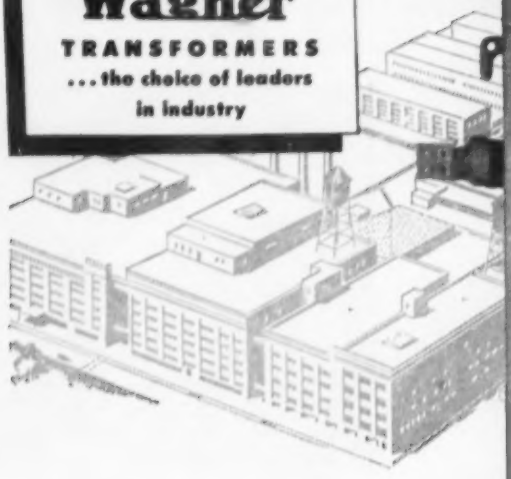


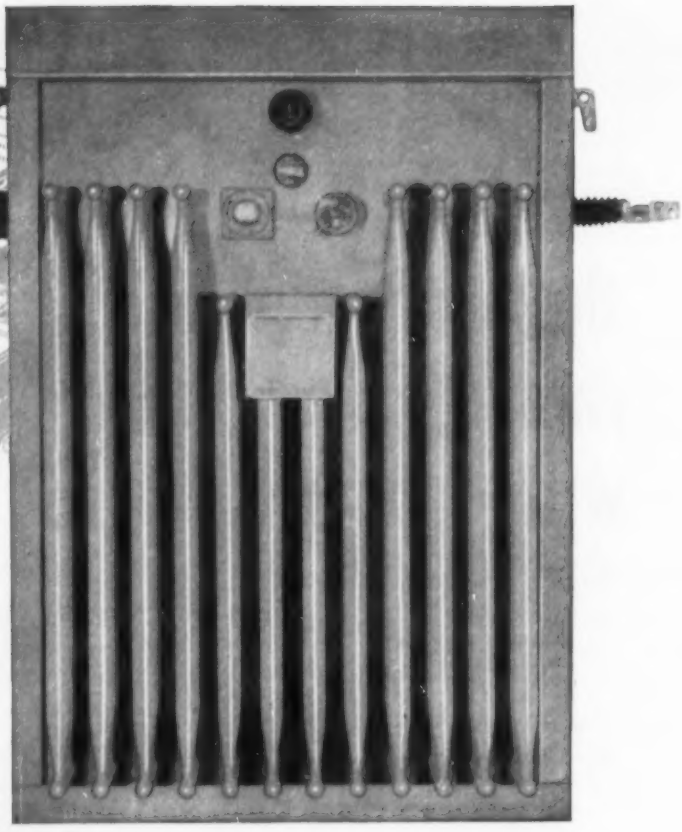
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ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS-AIR AND HYDRAULIC

Questions on the Code

Answered by

B. A. McDONALD, *New York Board of Fire Underwriters, Rochester, N. Y.*
GLENN ROWELL, *Electrical Engineer, Fire Underwriters Inspection Bureau, Minneapolis, Minn.*
B. Z. SEGALL, *Consulting Electrical Engineer, New Orleans, La.*

Transformer Connections

Q. *I have some questions in which I know the answers but too often have been called on jobs to correct and therefore suggest that you insert them in "Questions on the Code". I am sure they will be of some help to most readers.*

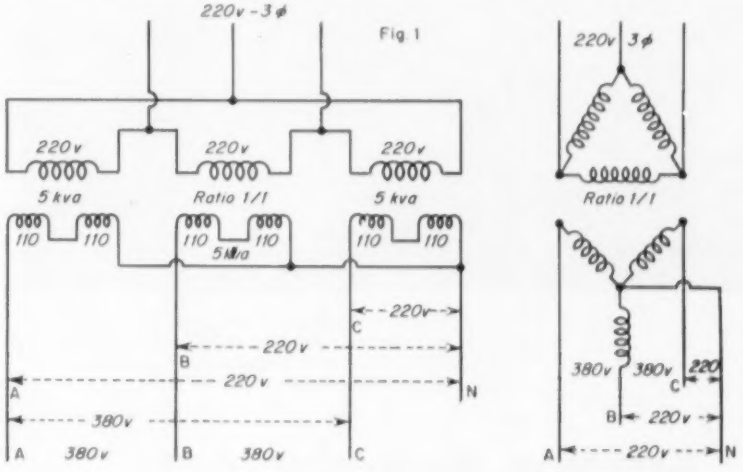
How can three 5 kva single phase transformers, 220-volt primary to 110-220-volt split secondary, be connected on a 3-phase 220-volt delta connected service to feed a load of 15 kw, using a 12-circuit 3-phase 4-wire distribution panel? Branch circuits of 2-wire 110-volt and 3-wire 110-220 volts are used to supply the load. Loading of each circuit to be 1000-1250 watts. What current would each leg carry on the primary and secondary lines? Another question—If the primary windings of the three transformers were connected to a 3-phase system, could the secondary windings be paralleled to feed a single phase panel?

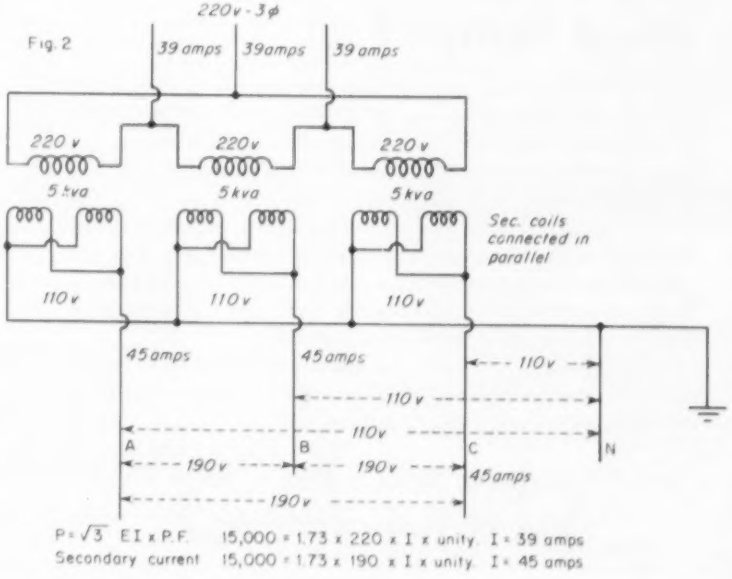
Can the secondary windings be paralleled if only two transformers were used of 7½ kva rating to feed a single phase panel, primary connected on 3-phase lines? E.D.P.

A. By the use of Fig. No. 1 I have shown the three 5 kva single phase transformers connected in delta on the 220-volt 3-phase primary. The secondary coils are connected in series and the combination connected in wye to give a 3-phase, 4-wire system. Since the ratio between the windings is 1/1, it is evident, with such a method of connection, that the voltages between phase wires to ground would be 220 volts with 380 volts between the phases. This of course is not what you desire.

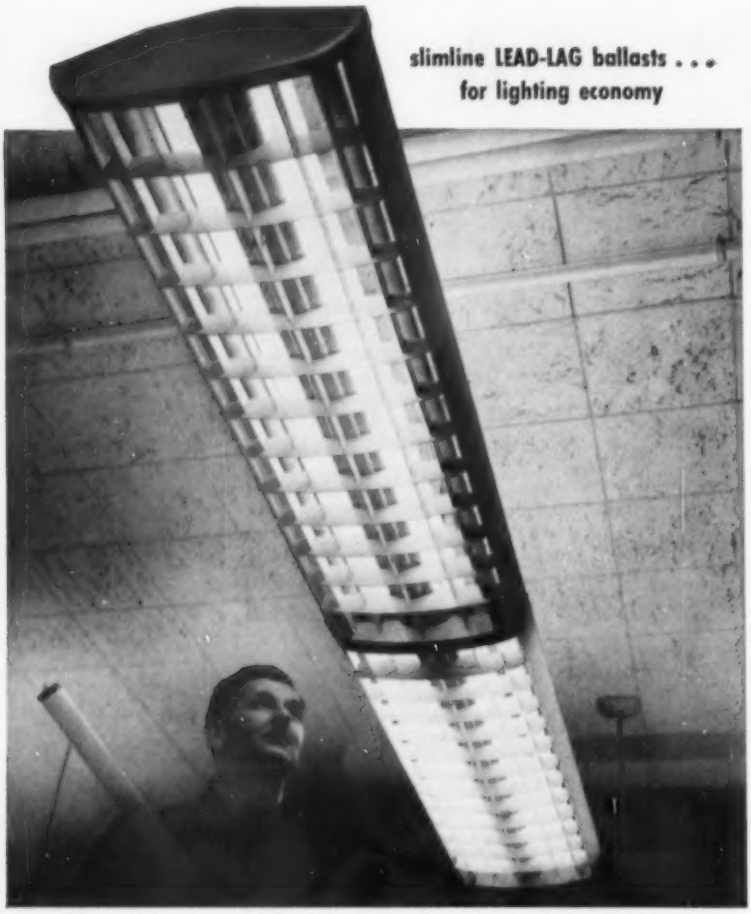
Fig. No. 2 shows the secondary coils of each transformer connected in parallel and the combination connected in wye which results in a 3-phase, 4-wire system where the voltage between the phase wires and ground is 110 volts and the phase voltage is 190 volts. It is essential however to see that the coils are properly connected and if the proper connections are not indicated on the transformer, these connections should be checked for polarity possibly by the use of a small fuse in the primary. This is important. This combination should serve the purpose desired.

It is not possible to connect the three primary windings in delta on the primary with the secondary windings in parallel to feed a single phase panel as you question. Such a combination will not result in the correct phase relation between the primary and secondary. The three coils of the primary could be connected in parallel over one of the phases with the secondary coils likewise paralleled to give 110-220 volts. The same holds true for your proposal to connect two 7.5 kva transformers over two separate phases of the delta, with





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the secondaries in parallel. Here again the primary windings of both transformers may be connected in parallel over one phase of the delta with the secondaries in parallel.

The currents in the legs of the primary and secondary are shown on Fig. No. 2. These values are computed on the basis of an equally divided load up to the transformer rated capacity.—B.A.McD.

Voltage Drop

Q. *Do you feel that the Code requires the total voltage drop to be kept at 1% or less on a farm property between the service equipment and the furthermost outlets? To us this seems most impractical especially when we have farm buildings located several hundred feet apart as they so often are. This means the use of extremely large conductors as feeders between buildings and the cost to us seems unjustfiable. Would it not be better to increase the voltage at the transformer secondary by taking off from a higher tap to assure more adequate voltage at the outlet?*—M.J.S.

A. It is my personal opinion that you are correct in your assumption that it is neither economical nor feasible to maintain voltage drop between the service and the furthermost outlets on the average farm property at 1% or less. If you will refer to Section 2202 of the National Electrical Code, you will note the choice of the word "should". In other words, this section reads as follows:

"The size of the feeder conductors should be such that voltage drop up to the final distribution point for the load as computed by Section 2203 will not be more than 3% for power or heating loads, and not more than 1% for lighting loads or combined lighting, heating and power loads."

In the first place, this is a recommendation and, in the second place, it does not mean the voltage drop should be 1% or less between the service and the furthermost outlet as this sentence reads that the voltage drop should be 1% between the service and the point of distribution. I believe an excellent plan to follow or to attempt to follow is the following:

Provide a service drop from the transformer to the service equipment which will not exceed 1½%

ADV.

How An Electrician Makes His Volt-Ammeter Pay

An electrical contractor in Elmont, N. Y., has found that a pocket-size, split core, a-c ammeter not only saves him considerable time, money and work, but also, by enabling him to make accurate on-the-job estimates, helped him convince customers of the need for additional wiring and installation.

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Another case involved repeated blowing of fuses on the circuit running a motor on a centrifugal dryer. This was 1-½ hp, 1750 rpm, 220 v. 60 cy, single phase motor fed by #12 line with a 30 amp fuse which was connected to a #8, 60 amp line. Checking one of the conductors of the motor, he found that it drew 48 amp on starting, sustaining a current in excess of 30 amp for 3 seconds and drew 9 amp once it came up to rated speed. Showing the customer that there was nothing wrong with the motor, but that he should change the #12 line and 30 amp fuse block to a #8 Rh wire and protect it with a 45 amp fuse, the job was sold with a nice profit.

In a third call, to a doctor's office where a fuse blew every time the sterilizer was turned on, he checked the current with the sterilizer disconnected. His Amprobe showed 15.3 amp load. Checking the premises uncovered the difficulty—a ¾ ton air conditioner had been plugged into the same circuit. It was no trouble convincing the doctor that a separate line was needed for the air conditioner, and another wiring job was sold.

These examples are but a few of the many thousands of ways an Amprobe will pay off for electrical contractors. For more detailed information, write Pyramid Instrument Corporation, 630 Merrick Rd., Lynbrook, N. Y.

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- ☐ Trouble-shooting electric motors
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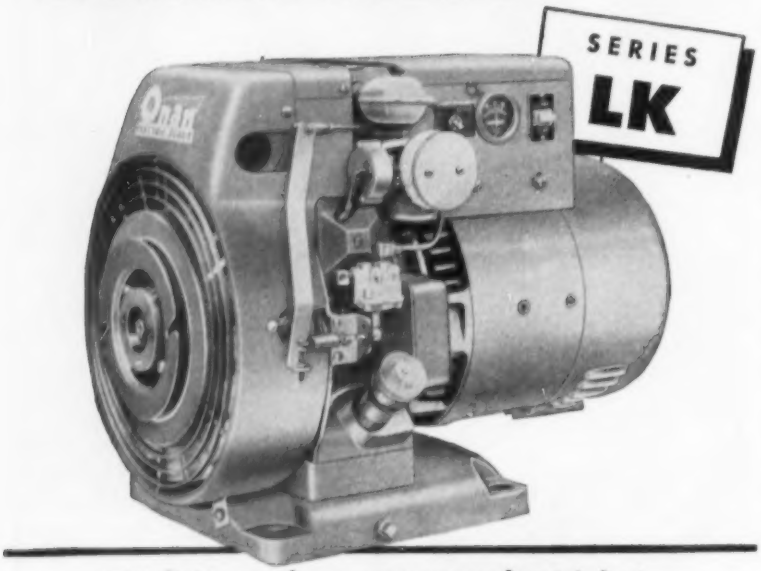
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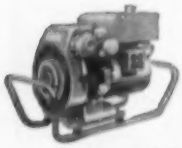
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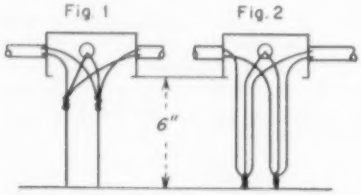
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voltage drop. Keep your feeders of sufficient size between the service equipment and the various points of distribution in the different buildings as near 1% as is practical. Then size your circuit conductors within the buildings to hold them as near as practical to a 1% voltage drop giving you an over-all voltage drop of approximately 3% or 4%.—G.R.

6-in. Free Conductor At Outlet

Q. *This question concerns the 6-in. free conductor at outlets. Article 3006 covers this and it is my understanding that each wire must have 6 in. extending out of the box. The sketch shows two ways of making up a box, Fig. 1 is the way most wiremen make a box, that is just enough wire for a splice then a 6-in. pigtail to be attached to the device. This way they have not such a bulge to tuck into the box. If it is just a pullbox with nothing attached then all wires are cut off short and tucked into the box.*

However, as shown in Fig. 2 this method of makeup seems to comply to the Code in spite of the fact that it will be a more difficult job of tucking the wires into the box even though the box has not over the maximum wires allowed for its capacity. I have had some contractors and foremen become angry if the makeup was done as shown in Fig. 2. Which way is correct?—G.R.G.



A. A literal reading of Section 3006 infers that this 6-in. provision applies only to an outlet and switch point. Since the Code definition of an outlet is a point at which current is taken to supply some type of load, it appears that a pull box would not be involved with this rule. I do not believe that this was intended since the importance of good splices at outlet or switch points applies also to splices in a pull box. There should, in my opinion, be no distinction. The purpose of the rule is to leave enough wire for two reasons: 1.—

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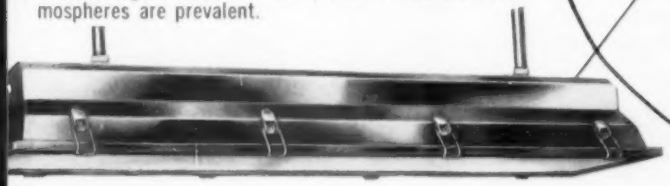
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For atmospheres containing carbon black, coal, coke, flour, starch, grain or easily ignitible flyings or fibers.



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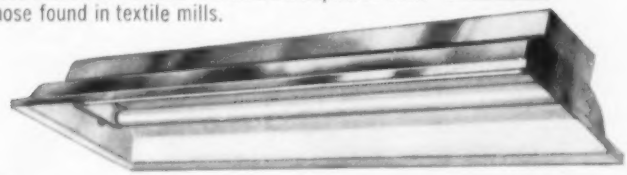
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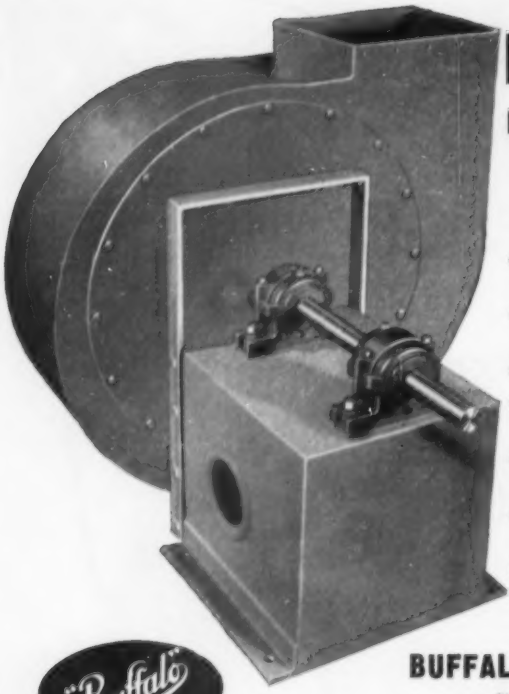
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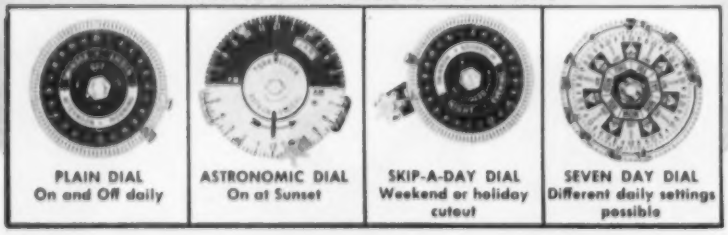
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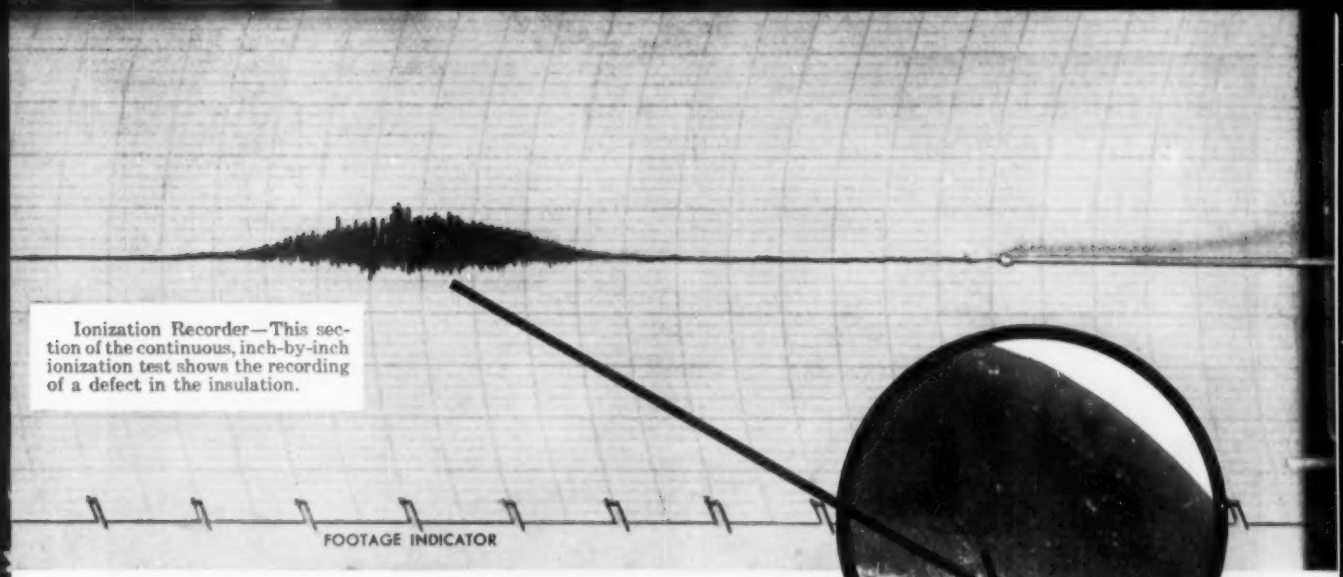
PLAY SAFE-USE THE BEST
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making joints, and 2.—connecting fixtures and devices. The amount of wire considered necessary is 6 in. I believe the explanation given in the Abbot-Smith National Electrical Code Handbook clarifies the reasons for the rule. It says "It is usually considered a part of the wireman's work to complete all splices at outlets, leaving a pair of wires (or sometimes more) extending from the outlet for the connection of fixtures; these wires, or any others not spliced or looped through the outlet box, should project at least 6 in. from the box, except that wires looping through the box and intended for connection to sign receptacles or similar devices need have only sufficient slack so that the connections can be made easily. Special care should be taken in making the splices at the outlets; otherwise trouble is likely to occur at these points. If the circuit wires at the outlets are too short, it is difficult to make thoroughly good splices and to tape them properly."

In the absence of any Official Interpretation on this point, I may only express a personal opinion. While some folks interpret the 6-in. length to cover the distance from the bushing or fitting to the end of the conductor, it is my opinion that the length should be measured from the face of the box. I say so because, in the case of a deep box we would have less than 3 in. protruding below the face of the box. The wording of this rule implies to me that while we must have 6 in. of conductor protruding from the box, we do not necessarily have to have 6 in. protruding after the splice is made. I therefore do not believe the case shown by Fig. No. 2 is intended. It appears to me that the case shown by Fig. No. 1 is more correct but I do not believe the splice should be cut off short so that in the event a new fixture or receptacle were to be installed, there would be any difficulty in making a proper connection.—B.A.McD.

Grounding—Dry-Type Transformers

Q. *Fig. No. 1 shows one building of a group of buildings comprising a one-owner property. The distribution to the buildings is overhead at 440 volts, 3-phase delta. For the building shown, a 2-wire tap is taken off and run to the build-*



Ionization Recorder—This section of the continuous, inch-by-inch ionization test shows the recording of a defect in the insulation.

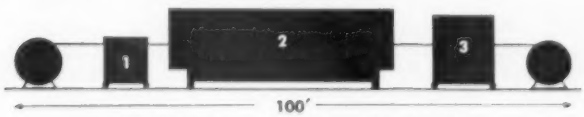
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"Gooding Test Train" detects flaws in insulated power cable (4kv and over) heretofore unrevealed by standard tests

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The "Gooding Test Train" consists of a series of three test sets. The entire length of cable passes consecutively through each set as follows:



SCHEMATIC DRAWING OF GOODING TEST TRAIN

1. Uniformity Test—A uniformity gauge continuously checks insulation thickness—locating any thin spots which might cause premature failure.

2. Ionization Test—This is the most important unit of the "Gooding Test Train". It can measure the corona level at any spot along the cable. Procedure is to test the cable *inch-by-inch* at a predetermined voltage which is sufficient to assure the user that the corona level is at least 1½ times the rated voltage. Voids and imperfections as small as a grain of sand have thus been identified and removed.

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By such intensive testing, it is possible to eliminate previously unidentified imperfections that might otherwise lead to premature failure. Studies of such defects also help to identify the cause and permit preventive measures. The "Gooding Test Train" is now being used to test all Okonite's rubber-insulated cables rated at more than 4000 volts. It is a long step towards securing the "perfect cable" and, as such, of tremendous benefit to cable users.

For detailed information about Okonite's G.T.T. write for new Bulletin EC-1100, to The Okonite Company, Passaic, N. J.

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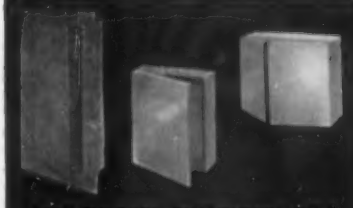


BOSS
WIREWAY
CUT OUT BOXES
CABINETS

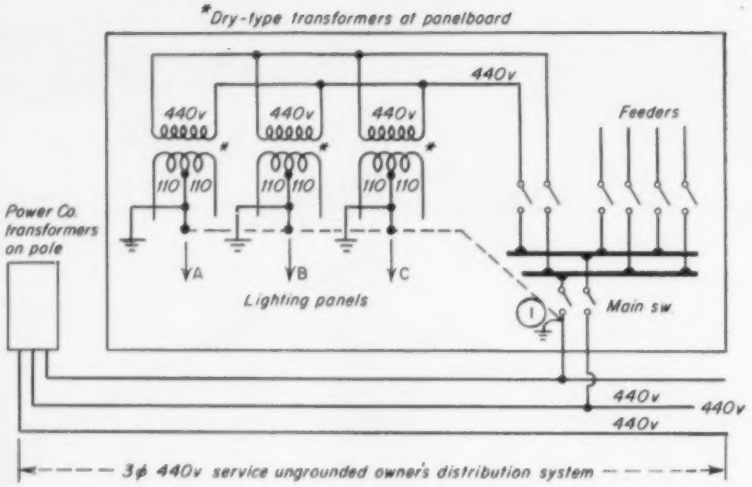
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ing and distribution throughout the building is at 440 volts to a single-phase transformer throughout the building. The problem concerns the proper grounding procedure for this installation. Would it be proper to ground at each transformer as shown by the solid lines or would it be necessary to ground as shown by the dotted lines. The ground at location marked (1) would be required according to Section 2524 and according to Section 2002 it would not be permitted, which is seemingly contradictory. How would the provisions of Section 2523 affect this problem?—F.D.

A. According to Section 2514 of the Code any secondary alternating system supplying interior wiring, and interior ac wiring systems, shall be grounded if they can be so grounded that the maximum voltage to ground does not exceed 150 volts. Section 2526 covering isolated systems, such as presented by your problem, requires an interior wiring system which is required to be grounded and which is not connected to an exterior secondary distribution system, that the grounding connection shall be made at the transformer, generator, or other source of supply, or at the switchboard, on the supply side of the first switch controlling the system.

As shown by your illustration, we have an ungrounded 440-volt, 3-phase delta distribution system, and in order to obtain 110-220 volts for lighting and small appliances we install dry-type isolating transformers at the panelboards which serve such loads. These transformers isolate the lighting circuits from the 440-volt distribution system since there is no electrical connection between the two systems. Since the secondary voltage is less than 150 volts to ground this isolated system must be grounded.

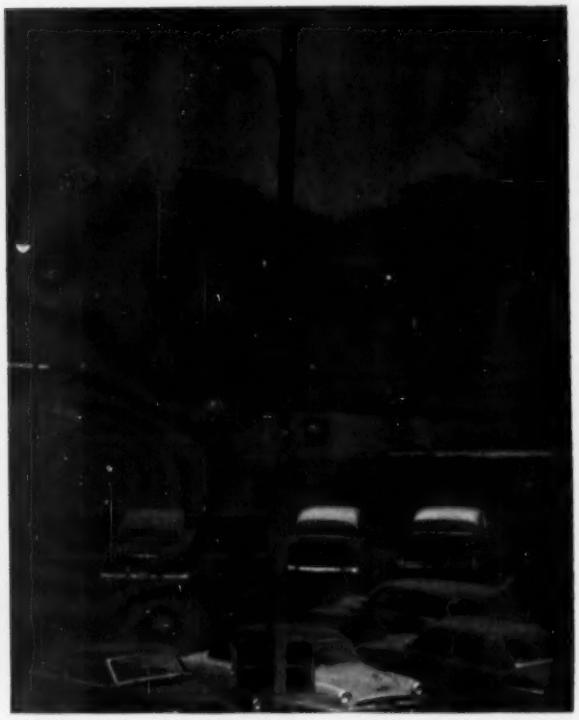
According to Section 2526 the grounding connection shall be made at the transformer with the grounding conductor run direct to a grounding electrode as provided for in Sections 2581 to 2583. This method is indicated by the solid lines shown on your illustration. Section 2524 does not in my opinion require a ground on the 440-volt distribution system as shown at the location marked (1) and therefore there is no conflict with the provisions of Section 2002. While one phase of a 440-volt system may be grounded, the provisions of Section 2524 does not require same and would apply only when the 440-volt system was properly grounded. Section 2523 is not concerned with the grounding of the secondaries of the dry-type transformers since they are isolated from the 440-volt distribution system. I believe that the provisions of Section 2526 covering isolated systems fully covers and recognizes the grounding connection at each transformer. The 1956 Code undoubtedly will further clarify this question by inserting in the third line of Section 2526 the word "electrically" between the words "connected and to".—B.A. McD.

Wiring A Grain Elevator

Q. *During the year of 1950, we wired a new grain elevator and had no trouble in getting the approval of the local inspection department on our installation.*



LINE VOLTAGE DROPS TO 80V ON SOLA CONSTANT-WATTAGE BALLASTED INSTALLATION: *"Outages" are prevented due to the patented constant wattage circuit in Sola Mercury Vapor Lamp Transformers. Even when line voltage drops as low as about 75v on a 115v line, lamps stay lit, eliminating the need for "auxiliary" incandescent or fluorescent lighting installations.*



LINE VOLTAGE DROPS TO 80V ON CONVENTIONALLY-BALLASTED INSTALLATION: *Line voltage drops often cause outages. Until lamps return to strikeable condition, vital minutes of production time may be lost in industrial installations; safety hazards may exist in parking lots (as shown above) or playgrounds or plant area protection applications.*

Sola Constant Wattage Transformers For E-H1 400w Mercury Vapor Lamps End Outages Due to Line Voltage Drops

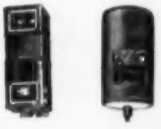
When your mercury vapor lighting installation is ballasted with Sola Mercury Vapor Lamp Transformers, you can rely on dependably-maintained light output. First, outages are virtually eliminated since primary voltage must drop below about 75v on a 115v line before lamps extinguish. Second, the Sola Patented Constant Wattage Principle assures lumen regulation within $\pm 2\frac{1}{2}\%$, even in the face of line voltage variations as great as $\pm 13\%$.

In addition, Sola Constant Wattage Mercury Vapor Lamp Transformers offer the following advantages over conventional ballasts:

- Eliminate the need for primary taps . . . positive starting within the primary ranges of 100 to 130 and 200 to 260 volts.
- Low starting current surge . . . line current during starting interval limited to effectively no more than normal full load value.
- Open and short-circuit protection . . . primary current positively limited under abnormal operating conditions of lamp failure, or external short circuit . . . constant wattage circuit eliminates any lamp electrode rectification.
- Extended lamp life . . . regulated voltage, current, and wattage permit continuous, stable operation, resulting in superior lamp life.
- Low crest factor . . . (peak/rms ratio) of lamp current averages only 1.7 at 115v primary supply.

It will pay you to investigate the advantages of Sola-ballasted mercury vapor lighting installations for both indoor and outdoor high intensity lighting applications. Request your Sola representative to call.

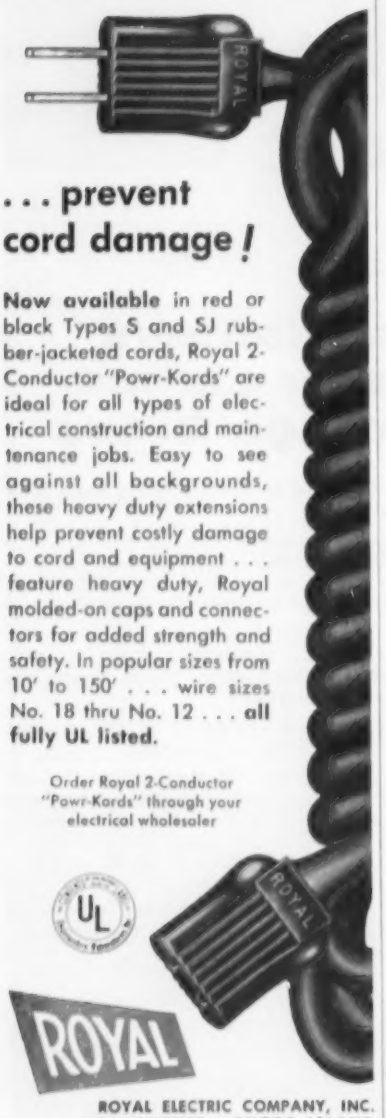
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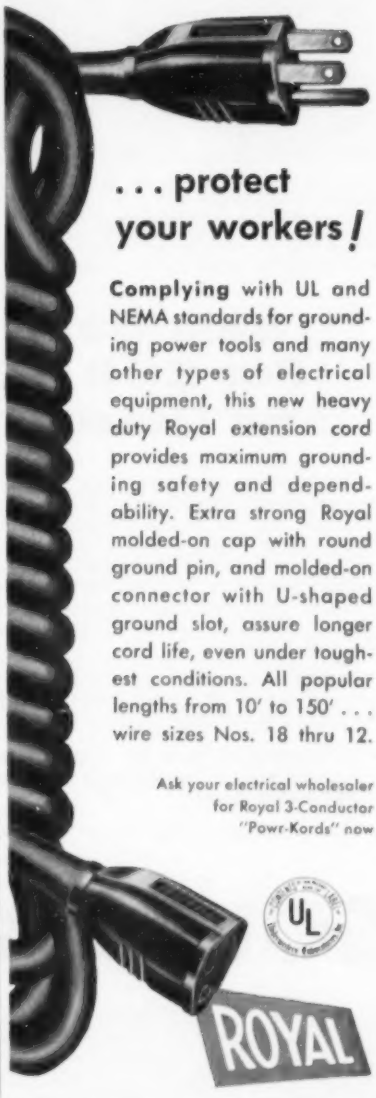
ROYAL ELECTRIC COMPANY, INC.
PAWTUCKET • RHODE ISLAND

During the past few months, an addition has been added to this elevator and we were called in to wire this new addition. The inspector on his first visit during the rough-in advised my foreman that the pull and junction boxes which were used in the original installation can no longer be used as they do not comply with the Code and when we asked him how come they were approved in the old section of the building, he just said that probably the former inspector did not know his Code too well. The pull boxes and junction boxes which were used all had hubs and the covers on the the pull boxes were held in place with metal screws of the self-threading type while the pull boxes were conventional hubbed boxes available on the market. Is the present inspector right in his refusal to allow us to use boxes which were OK'd by the former inspector?—M.C.

A. The 1947 and previous editions of the National Electrical Code required the use of dust-tight boxes only in Class 2 locations where the dust encountered was of a conductive nature. In the 1951 edition of the National Electrical Code, this was revised and under Section 5054 of that code it still required the threaded hubs but also required that such a box should have a close-fitting cover and should have no openings through which sparks or burning material might escape and, in addition, it specified that any fitting or box containing taps, joints or terminal connections would have to be of the type approved for use in a Class 2 location.

Therefore, inasmuch as the elevator which was constructed during 1950 was wired in accordance with the 1947 edition of the National Electrical Code, the former inspector was correct in approving for use the boxes you used and the present inspector is also correct in refusing to accept boxes which were formerly considered adequate for use in a nonconductive dusty atmosphere. This change has no doubt been made as a direct result of disastrous experience had with nondust-tight boxes. Conductors carrying electrical energy must dissipate heat and a conduit fitting or pull box or conduit filled with dust would materially reduce the ability of such conductors to dissipate heat generated upon them causing them to overheat and accelerate deterioration of the insulation used.—G.R.

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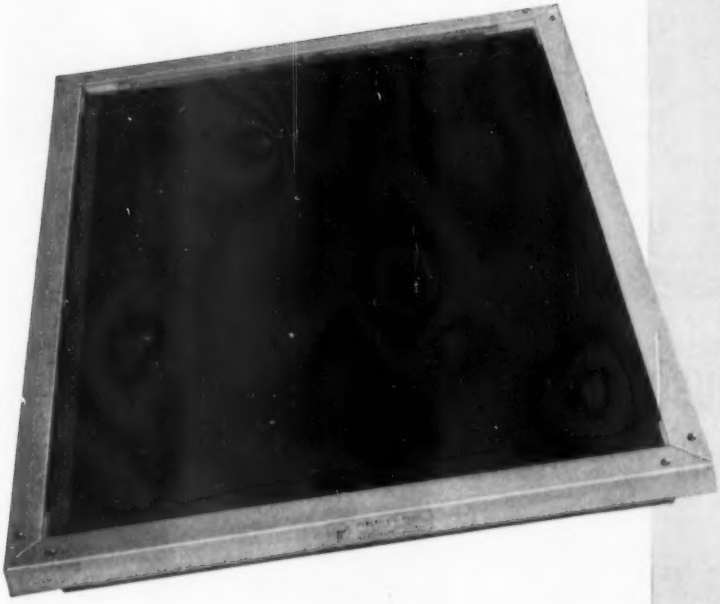
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PYREX E-C panel's sales features are helping to create wider acceptance for electric heating

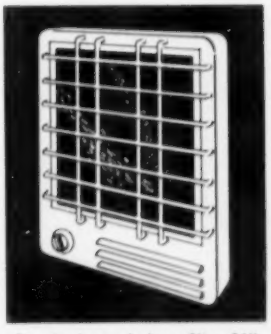
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In The News

Plant Maintenance Conference and Show Attended By 20,000

The tremendous interest being focused on the subject of industrial maintenance was again demonstrated at the 7th annual Plant Maintenance and Engineering Conference and Show, for this year over 2500 delegates attended the 3-day Philadelphia conference, while more than 20,000 registered for the concurrently-staged 4-day equipment, product and service show. Presenting a program tailored to answer questions raised by former delegates, national surveys and hundreds of letters received from maintenance personnel, General Chairman L. C. Morrow, consulting editor of *Factory Management and Maintenance*, this year grouped his subjects into two general sessions, eight sectional conferences and 15 round-table discussions, presenting all of the conferences and 10 of the discussions twice to permit maximum participation by delegates, and including many subjects not included on any of the six previous programs. These sessions and discussions were led by 45 recognized leaders, representing the full scope of the maintenance field, while audience-participation was so active that hundreds of written questions had to be deferred for post-conference answering by mail.

Opening the initial general session, Chairman Morrow mentioned several trends towards automatic industrial operations and pointed out that automation is placing greater importance upon preventive maintenance. He added that, contrary to popular assumption, automatic operation is increasing, rather than decreasing, the resultant labor force. This he verified by citing a recent survey of 1574 industrial plants, wherein 51% reported no change in total employment as a result of automation; 26% reported employment increases averaging 21% above their former forces; 40% reported that greater maintenance skills were now required, and 21% said that their engineering staffs had been increased also. Referring to growth patterns in population, production requirements, employment and shorter work-weeks, he pointed out that, by 1975, the expected labor force of 86 million will be inadequate to meet production requirements, unless automatic operations and maintenance programs are employed to even greater extents than they are today. "So let's keep trying as hard as possible to improve ourselves", he concluded, "without worrying about the myth of putting people out of work".

Active Forums

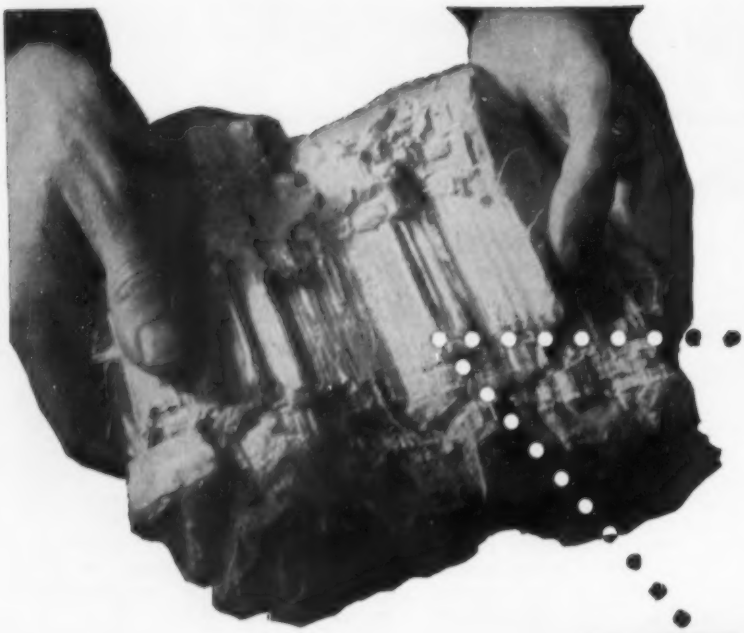
Of particular interest to electrical men were round-table discussions on (1) Electrical Equipment, (2) Tool Room Control, (3) Report Writing, and (4) Forms, Records and Reports, which were led, respectively, by Joe St. Andre, chief electrical engineer for Kaiser Aluminum in Newark, Ohio; Charles E. Moore, works manager for Yale and Towne in Philadelphia; James Williamson, director of the management-service division at Temple University, and W. G. A. Reggel, plant maintenance engineer for International Nickel at Huntington, W. Va.

Also of interest to electrical men were sectional conferences on (1) Use of Independent Contractors, (2) Maintenance Shops, (3) Maintenance Yardsticks, (4) Getting Maintenance People To Work As A Team, and (5) Replacement Policies, at which conferences the delegates heard from such authorities as Henry Killmar, manager for technical services at Carborundum's plant in Perth Amboy, N. J.; James E. Baltzell, Jr., representing the Middletown, Ohio, maintenance division for Armco Steel; Raymond Reul, staff industrial engineer for the Food Machinery and Chemical Corp. in New York City; Ervin Selzer, manager of industrial engineering for Electric Storage Battery in Philadelphia, and John Sayer, manager of du Pont's maintenance engineering section in Wilmington, Del.

On the subject of Independent Contractors, Killmar mentioned that jobs in any plant naturally pile up at times and the use of independent contractors as an adjunct to the plant engineering department is the logical answer to this condition, because the plant engineer then has the use of additional manpower, special tools and special talents. There are also large or specialized repair jobs that the average plant staff is incapable of handling, he continued, such as major repairs following a flood or storm, large-scale modernization projects, repair of overhead doors, elevators, electric fork trucks, electronic work and the like.



SEVEN PAST-PRESIDENTS of the Illuminating Engineering Society attended the organization's 50th anniversary luncheon at the Sheraton-Astor Hotel, New York, on January 11, 1956. This hotel was the birthplace of the Society on January 10, 1906. Shown with current president, R. F. Hartenstein, they are: (L. to R., seated) Dr. George S. Crampton, Dr. Ward Harrison, William F. Little, and Dr. Joseph W. Barker; (L. to R., standing) Lee Tayler, Pres. Hartenstein, Duncan M. Jones and Dr. Samuel G. Hibben.



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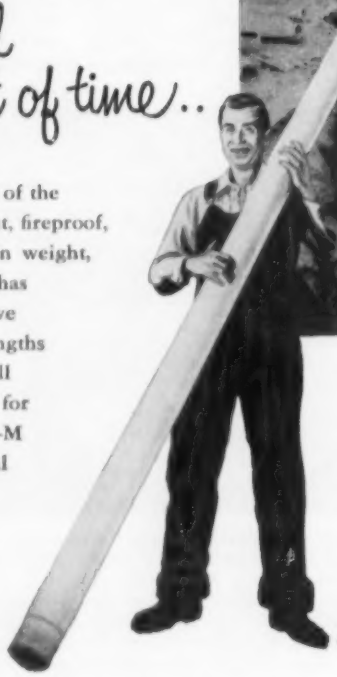
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In these instances, he said, contractors furnish the answers, and it is just good business practice to use and cooperate with the contractors on an all-out scale. This can be done, he concluded, by offering the contractor and his workers such courtesies as the use of plant parking space, first aid facilities, cafeteria service, service buildings and other normal plant-employee comforts.

Discussing Maintenance Shops, Baltzell said that in-plant maintenance departments (1) provide a ready means for having skilled craftsmen available for integrated maintenance programs, (2) provide central locations for special equipment and tools required for special work, (3) keep capital expenditures at a minimum, (4) form a nucleus of skilled man-power and machines in event of emergencies, and (5) also provide the nucleus for plant expansion, modernization and new building. This latter practice should be carried out with discretion, he said, otherwise, the normal maintenance routines would be badly disrupted.

Concerning planning and scheduling, he mentioned that proper organization should include adequate preparation (tools, materials, craftsmen), instruction to workers, tie-in between crafts involved, clearance of priorities and verification of all job orders required.

Thoughtful Discussions

In an unusually thoughtful and provocative analysis of Maintenance Yardsticks, Reul stated that in many plants the number of employees required for maintenance has already exceeded the number of operating personnel, so that maintenance now represents a major cost factor and should be controlled as much as possible by first reducing necessary maintenance to a minimum, then performing that minimum as efficiently as possible. He said it is hard to compare maintenance results from plant to plant, however, because basic requirements vary in different plants, bookkeeping methods place similar functions under varying headings, and maintenance departments frequently perform non-maintenance functions. For example, true maintenance should be limited to housekeeping, routine servicing, emergency action, repairs and replacement of parts, yet many maintenance departments are also charged with the responsibility for construction of new facilities, modifications, experimental work, shipping and handling of materials, operation of equipment, plant protection and so on.



OFFICIAL FAMILY of the Cook County Electrical Contractors Association, Inc., Chicago, includes: (L. to R.) George A. Rafel, secretary; Erwin Kaufman, treasurer; Lou Matson, president; and William Veldhouse, vice president. These officers, together with an 8-man Board of Directors, guide the activities of the association now numbering approximately 100 contractors.

To keep maintenance charges factual, therefore, unrelated functions should be segregated, unnecessary work eliminated, quality of workmanship kept high, preventive work promoted, equipment abuse eliminated, and design of equipment improved. Each of these points was clearly illustrated as, for example, improving manpower utilization through better planning, scheduling, ordering procedures, tools, methods, incentive pay scales and the like. In conclusion, Reul stated that properly compiled and accurately recorded historical records are the only basis for evaluating overall maintenance performance but, to be useful, maintenance charges should include only directly allocable costs, segregated into equipment groups and operation divisions for factual proof of performance.

In advocating better Team Work in industrial plants between maintenance workers, supervisors, trade foremen and manufacturing managers, Seltzer suggested that maintenance superintendents and plant engineers should take time out occasionally to ask themselves such challenging questions as: Do your men know at night what they are scheduled to do early the next morning? Do they know how much time the job has been scheduled for? Have they been acquainted with the importance of their job, and have they been encouraged and praised for good work already performed? Are the men worried about job security? Are the men well-qualified journeymen? Can they get proper recognition and advancement by rendering quality service? Do they know the cost of the equipment they are working on, and the overall cost of the job they are participating in? Is plant equipment modern? And is your leadership of a high quality?

In elaborating upon these and other questions, Seltzer pointed out that maintenance men are human beings who naturally resent being the "whipping boys" of industry; the fellows who are supposed to do all dirty jobs at all times in all weather without complaints and, "cursed, abused, berated and hounded, are expected without thanks to provide ammunition, food, water and accessories for managerial Redcoats to fight the good fight." The dictionary defines a "team", he concluded, as "two or more beasts-of-burden harnessed together and driven with reins and a whip", yet true team work can only be obtained when all individuals know the signals, know how their efforts will effect the game, know and respect the abilities of their team-mates, and know that their own endeavors are recognized and appreciated.

Determination of an effective policy for parts replacement or for the acquisition of either tools or equipment is strictly an overall economic consideration, said John Sayer of du Pont, adding that his company is not too concerned if maintenance costs go up if, as a result, manufacturing costs come down. These overall manufacturing costs can be reduced if improved maintenance results in greater continuity of operation, reduced equipment downtime, better performance of equipment and more consistent quality of products. This recognizes the fact that maintenance is

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on the same team with research, engineering and operation, and the cost of improved maintenance is well justified if the expenditure results in decreased manufacturing costs and, hence, increased profits.

Speaking on tool replacement, Sayer mentioned that the basis for replacement is dictated by three considerations; necessity, safety and economy. He also said that obsolescence should be considered, raising such questions as: Will improved equipment permit you to do a job quicker or better with less manpower? Will a new motor have a better power factor, better starting or overload characteristics, and will it result in fewer kick-outs or lost production? Age of equipment, taken alone, is not a governing criteria, he stated, but it should be remembered that progress in all fields has been rapid and continuous, so that old tools and equipment have quite likely been superseded by newer and more efficient products.

Two General Sessions

At the two general sessions, delegates were told about Maintenance Controls and How To Look At Maintenance, the first of these subjects being panel-discussed by Stuart Whitehead, general superintendent for maintenance and construction at American Cyanamid's plant at Bound Brook, N. J.; Oswald Stewart II, project engineer for Dewey & Almy Chem. Co. at Cambridge, Mass., and C. J. Zetler, Jr., works engineer at Westinghouse Electric's East Pittsburgh Works. The second topic was covered by John Vonderheide, manager of plant engineering at General Electric's Appliance Park Project in Louisville, Ky., and I. G. Sunderman, head of the maintenance division for Bakelite at Bound Brook.

During the first of these sessions it was brought out that planning and scheduling must be combined with effective labor utilization, development of a functional organization, realistic materials inventory, factual cost history records, continual modernization of equipment and facilities, both routine and preventive maintenance, a progressive educational program and continual review of job methods and techniques. It was also mentioned that preventive maintenance can be carried to extremes, so experience and common sense should dictate when valuations, importance or use of equipment, machines or devices justify the time, energy and related costs of a preventive maintenance schedule.

Here again it was stressed that quality and costs of maintenance and production are closely related, and that outside contractors and inside maintenance crews can be combined to give maximum benefits to the plant's upkeep and repair.

The second general session enumerated advantages associated with both centralized and decentralized maintenance departments, scheduled and emergency work programs, apprentice training and productive supervision, fixed and incentive pay scales, use of records and paper work. Preventive vs corrective maintenance work was also discussed, as were recommended procedures concerning analysis of classified data, clerical routines, routine and periodic inspection. Speaking from four years experience with the Bakelite maintenance department, Sunderman concluded that during that time the number of maintenance personnel had remained constant, although the size of the plant had grown and production had materially increased.

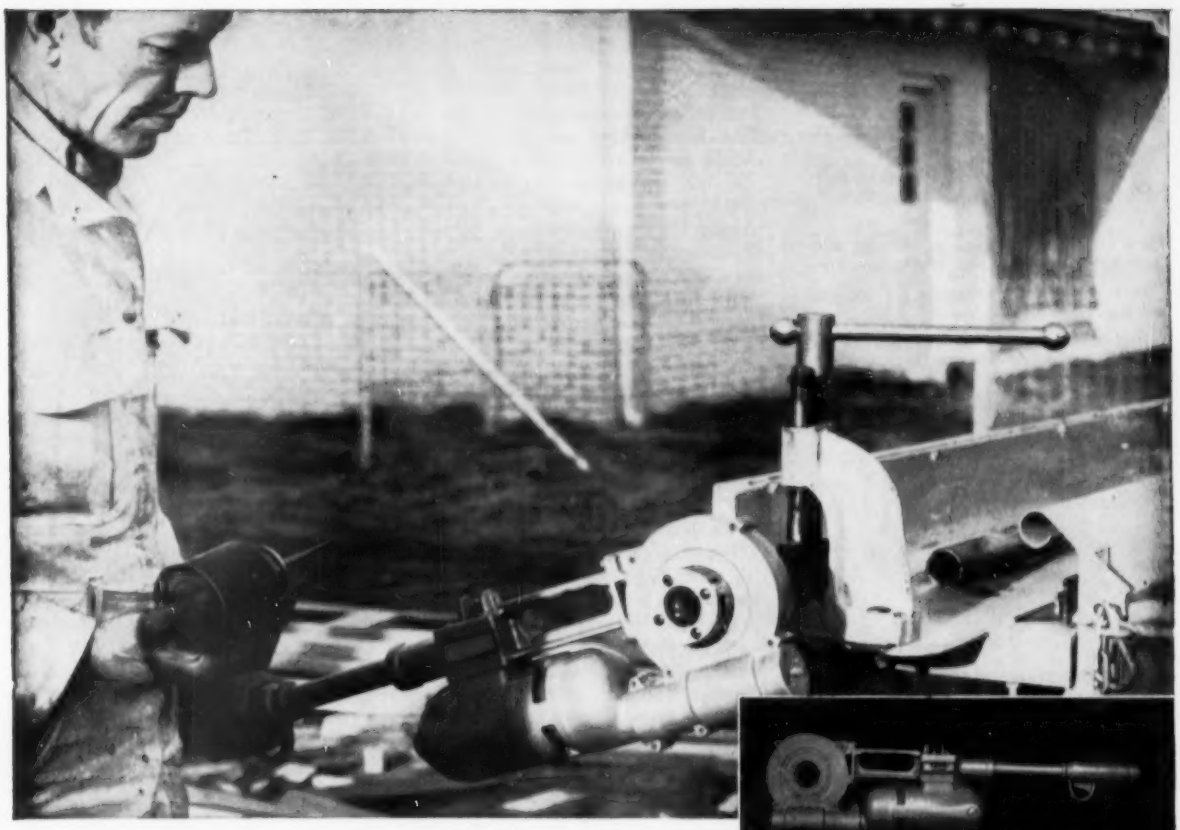
L. O. Trim Is New President of IAEI

Larry O. Trim, electrical inspector of Burbank, Calif., is the new president of the International Association of Electrical Inspectors. He was recently elected to succeed Col. S. R. Todd of Chicago whose term of office expired. Mr. Todd, an electrical inspector for the City of Chicago, is vice-chairman of the recently formed National Electrical Week Committee.

President Trim brings both practical and academic experience to his new office. Following gradua-



LARRY O. TRIM, president, International Association of Electrical Inspectors.



The Lawco, Jr.—portable, versatile, compact. Does a variety of jobs faster, better.

Threads Conduit in seconds

...*the Lawco, Jr.*

PORTABLE PIPE THREADER

Here's the answer to those slow, tiring, hand-threading jobs. The Lawco, Jr. Portable Pipe Threader does the work in seconds. This modern portable power tool threads the smallest to the largest conduit. Simple adapters and speed reducers handle pipe from ¼-inch to 10".

Its operation is simple. Just position Lawco, Jr. on the conduit, press the trigger, and the power unit drives the cutting dies. You're finished in no time, and right at the location where you are installing the conduit.

And Lawco, Jr. comes in handy for other jobs, too. Several are illustrated at the right. In addition to these applications, you can use your Lawco, Jr. for driving nuts and bolts, and hoisting weights up to 500 pounds.

This light weight (20 lbs.) tool is precision built for years of service. Write for details.



Augering operation with Lawco, Jr. Efficient in vertical or horizontal operations.



Post hole application using square shank. Lawco, Jr. does it faster.



There's nothing better for pulling wire through conduit than the Lawco, Jr. The unit's portable feature speeds work.

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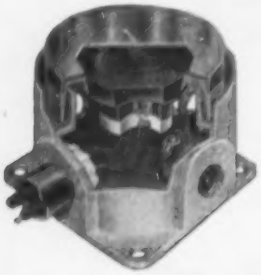
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There is nothing complex or intricate about "Latrobe" Floor Boxes and Wiring Specialties.

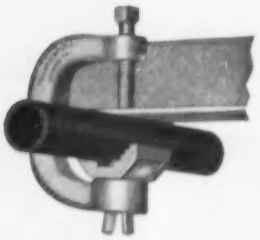
Their design and mechanism is kept simple and sure.

That is why "Latrobe" products are so quick to install and so trouble-free in operation.



ADJUSTABLE FLOOR BOXES

Adjustable Floor Boxes are now bonded which makes them fire-proof—come in single round or square bodies—also furnished in square single gang, two gang, three gang and four gang types.



PIPE OR CONDUIT HANGER

Most economical and best pipe hanger sold today. The saddle comes firmly fastened to the hanger bracket and cannot drop out. For hanging pipe or conduit ½", ¾", and 1" to steel beams up to ⅜" thick. Larger sizes for larger pipe.

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tion from grammar school in Saginaw, Mich., he moved to California and graduated from Long Beach High School in 1922. While gaining practical experience, he continued his studies and received his State of California teacher's credentials in electrical subjects in 1931. For some time after that, he conducted apprentice and journeyman classes in electrical construction and electrical code. He enrolled with the International Correspondence School and completed courses in Electrical Lighting and Electrical Engineering. He also completed the State of California course in Teachers Training and is an accredited teacher of electrical subjects for the Adult Division. He is registered electrical engineer in the State of California.

Early in his career, Mr. Trim served four years in the Engineering Division of the Merchant Marine. His interest in the electrical profession led him to enter this field as a helper to Ben Wheater, Jr., past-president of the Southwestern Section, IAEI. During the early thirties he was employed with the United States Engineers and in 1933 became affiliated with the United States Bureau of Reclamation as a construction inspector and foreman assigned to the Boulder Canyon project.

On the basis of competitive examinations, he was appointed electrical inspector of Burbank, Calif., in May 1938. With the exception of a 25-month leave for service in World War II, his interest and activities have been in the electrical inspection field.

During World War II, he served in the United States Navy as Warrant Officer and Chaplain. He took part in many actions in the Asiatic Pacific and was with the Philippine Liberation and Shanghai Occupation Forces.

Mr. Trim is past-president of the Southwestern Section, IAEI (1947); past-president of the Burbank City Employees Association; and past-master of Burbank Lodge No. 406, F. & A.M. (1954). He is a member of the American Legion and Veterans of Foreign Wars.

N. Y. Section IES Holds Store Lighting Clinic

On January 17 the New York Section of the Illuminating Engineering Society held an all-day session and clinic on store lighting, including a luncheon at which the 50th anniversary of the Society was celebrated. Seven lighting engineers, including the moderator for the clinic, talked on various phases of store lighting, and C. W. McCormick, illuminating engineer for the Connecticut Power & Light Co., Hartford, vice president of IES for the Northeastern Region, was guest speaker at the anniversary luncheon.

E. W. Beggs, Westinghouse Lamp Division illuminating engineer, Bloomfield, N. J., was moderator for the clinic. He opened the session with his own talk on the Development of Modern Store Lighting. Practically all goods sold in the U. S. is sold in stores, under electric lighting, he said, and stressed the importance of displaying the goods so they are attractive to the customers, and of making the stores bright, cheerful and attractive through lighting.

He showed a series of color slides which depicted the history of store lighting, ranging from outdoor markets, to open shelters, to en-

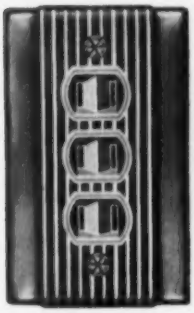


SPEAKERS at the day-long Store Lighting Clinic sponsored by the New York Section, Illuminating Engineering Society, held January 17 in New York City, were (l. to r.): Morris Ketchum, architect, New York City; Robert T. Dorsey, General Electric Lamp Dept., Nela Park; R. C. Allison, T. Eaton, Limited, Toronto; H. L. Logan, Holophane Co. Inc., New York City; R. L. Zahour, Westinghouse Lamp Division, Bloomfield, N. J.; E. W. Beggs, Westinghouse Lamp Division, Bloomfield, N. J.; and Rollo G. Williams, Century Lighting, Inc., New York City.

Faster, Easier Wiring...Reduced Installation Costs

With These Bryant Wiring Devices

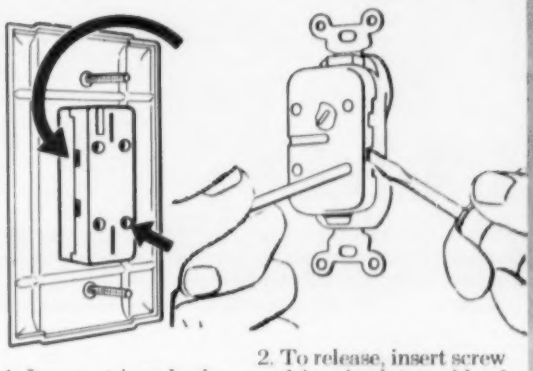
No. 6123 and 6100 with SPRING-GRIP TERMINALS





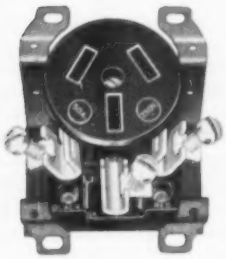
One step operation with these time-saving, cost cutting screwless terminals with:

- double-sided contacts
- all plastic construction
- mounting screws already inserted and held in place by washers
- handy wire stripping gage on back



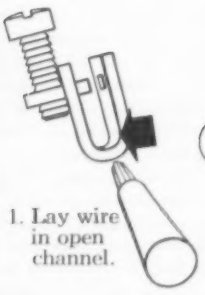
1. Insert stripped wire — connection is complete.
2. To release, insert screw driver in slot on side of base.

No. 3845 with PRESSURE TERMINALS



Speed installation time with these devices featuring newly designed pressure terminals:

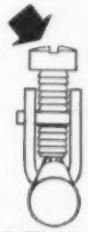
- wire can be inserted *without* removing upper portion of receptacle
- screw assemblies are permanently attached to channels
- rounded channel confines wire strands
- no loose parts to mislay



1. Lay wire in open channel.



2. Slide pressure screw assembly in slot.



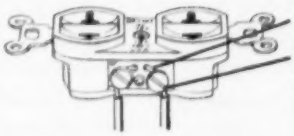
3. Tighten pressure screw.

No. 4832 with HOLE SNUB WIRING



Reduce installation costs with this easy and quick method of wiring. A top quality duplex convenience having:

- "T" slots
- double-sided contacts
- a secure way to attach conductors
- positive connections



1. Insert wire in snub hole.
2. Bend around screw in front of lug. Tighten screw.

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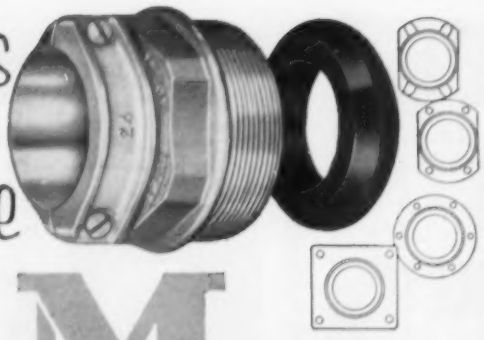
THE BRYANT ELECTRIC COMPANY

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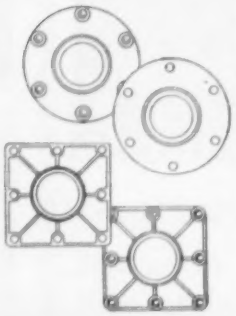
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WILLIAM J. WHEELER, JR. (left) has been elected vice president of The Maintenance Company, Inc., New York City, and Richard M. Wheeler (right) has been made a director of the Company. Bill Wheeler, Jr., has been a director for some time. The Maintenance Company, which is 59 years old, engages in electrical contracting, elevator and electrical engineering.

closed buildings, and thence with different types of light sources and lighting techniques up to present day methods and practices.

The Fundamentals of Store Lighting were presented by H. L. Logan, vice president in charge of Lighting Research, The Holophane Co., Inc., New York. He discussed visibility, color, accent, quality and quantity of illumination, and their interrelationships. Since stores are profit-making corporations, cost of lighting is important, he noted, as he indicated that lighting costs—fixed charges, and operating costs—today average about ½% of gross sales. Lighting equipment costs average from about 7% to 27% of total lighting system costs, he said.

Merchandise should be displayed under lighting intensities of from 30 to 150 footcandles, depending on color of displays, and of surrounding backgrounds and colors, Mr. Logan said. He also analyzed lighting distribution curves, pointed out how to determine which distribution form is most efficient and appropriate, and described the color chart used by Holophane to specify colors and finishes along with lighting recommendations.

Robert T. Dorsey, in charge of Lighting for Selling, Lamp Department, General Electric Co., Nela Park, discussed the Attractions of Store Lighting and Design, using an array of appropriate color slides to illustrate examples and lighting principles. He gave special emphasis to show window lighting and how to eliminate daytime plate glass reflections in show windows



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and store fronts; also to the creation of an appropriate atmosphere inside the store for increasing sales, by directing customers through merchandise lanes according to preplanned patterns. Keeping the rear walls light in appearance and brightly lighted, and the use of perimeter lighting are important factors, he said.

Mr. Dorsey also discussed the various types of lighting equipment and light sources, as well as lighting design and methods of making lighting calculations.

Color Rendition and Appraisal of Merchandise was the subject of a discussion by Rollo G. Williams, color lighting consultant, Century Lighting Inc., New York City. This discussion covered color reflections, environmental color values, and brightness contrasts. By means of slides he showed the color circle and explained primary and complementary colors, their composition and makeup, etc., and described the color spectrum of various "colors" of fluorescent lamps by means of spectral energy curves. Merchants must create in customers a "consciousness" of the color of an object that is reasonably accurate and based on fact, Mr. Williams said, and the customer will then always "know" that color is there, he explained—thus cutting down to almost zero the problem of returned merchandise because it fails to look the same after the customer gets it home as it did in the store.

R. C. Allison, head of the Engineering and Design Department of T. Eaton, Ltd., Toronto, Canada discussed two subjects related to store lighting: 1) Atmosphere: Case Histories of Store Modernization; and 2) Modernization: Case Histories.

Atmosphere, Mr. Allison said, establishes institutional prestige (good or bad), inspires customer confidence, helps increase impulse buying, sets up a personality for the store, among other benefits when the atmosphere is considered "good". Reverses of these benefits occur if the atmosphere is considered "poor", he said.

About 72% of the customers of the nation's stores are women, Mr. Allison explained, which makes it important for customers to look right, for when women look right, they feel right, and if they feel right, they buy. Each type of merchandise—impulse goods, semi-service goods, style goods—require a different type of atmosphere. Thus the atmosphere of a store should be, and actually is in practice, planned.



Just a squeeze sets the fastening stud in steel or concrete!

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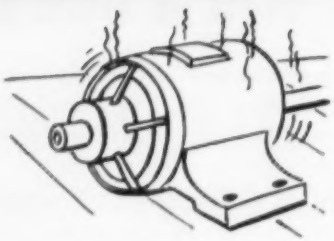
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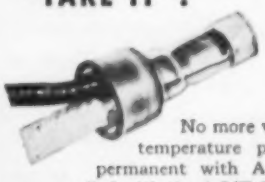
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NEW CHAIRMAN of the Electrical Maintenance Association, Nebraska-Iowa Electrical Council, Omaha, is Earl R. Wedberg, general electrical foreman of the Nebraska Division, Union Pacific Railroad. For 27 of his 30 years with the railroad, he has been in the electrical department and has been in his present position for the last six years. Under his jurisdiction comes general construction, building electrical maintenance, maintenance of lines and transformer substations.

Modernization case histories were illustrated by color slides, and represented many new lighting installations installed in many of the T. Eaton chain of stores throughout Canada. These case histories illustrated how "atmosphere" and visual environments had been created and improved over the pre-modernization conditions.

A discussion on Store Architecture and Interior Store Design was presented by Morris Ketchum, of Ketchum, Gina and Sharp, architects, New York City. Factors which affect store design, such as location, size, shape, parking space, type of merchandise, and others were discussed in detail, and then related to selection and design of the lighting system. Mr. Ketchum also pointed out how traffic flow and departmental locations affect the store design, and set the basis for the lighting requirements.

The store's sole function is to sell, Mr. Ketchum said. It must be planned from the inside out. A store provides shelter, needs an entrance front, a salesroom, and service or utilities entrance. The store provides two functions, he said, sales plus service. Goods generally are of three types—impulse, convenience, and demand—and the store structure, lighting, decorative treatment, etc., for each class of goods must be specifically planned for the sale of that class of goods. In de-

partment stores, each department becomes a separate design problem and must be treated as a separate specialty store for goods of the type sold in the department, and then each department must be integrated with the others. Color and light add a fourth design dimension, he said, but the merchandise itself is the most important consideration. In all cases, light sets the stage for shopping, indoors or out.

R. L. Zahour, illuminating engineer with Westinghouse Lamp Division, Bloomfield, N. J., discussed Store Lighting Maintenance, and the need to maintain the lighting intensity and lighting effects planned for—not only for the sake of economy and lower sales costs, but to maintain customer attraction to goods and desire to buy. Group versus individual lamp replacement was discussed, including other problems in maintaining the lighting system in good condition.

Over 100 members of IES and representatives from chain, department and specialty stores attended this store lighting clinic, and participated in the question and answer periods following the talks by the various speakers.

EEI Announces "Housepower" Campaign

More than 20,000,000 American homes, in which modern electrical appliances are being constantly added, have wiring facilities that are obsolete and under capacity.

That statement was made in New York recently by E. O. George, Chairman of the Wiring Committee of the Edison Electric Institute in announcing the Institute's comprehensive plans for a nationwide publicity campaign for adequate wiring in American homes. Centered around the theme of "Housepower," the program will have next May as its initial target date, and the up-grading of home wiring to "take maximum advantage of low-cost electricity for better living" as its goal.

The "Housepower" program objective is to impress home owners with the need for modernizing their house wiring to meet new demands created by the addition and use of an ever increasing number of modern electrical home appliances.

Plans to emphasize the "Housepower" theme and the objectives of the campaign call for extensive magazine, newspaper and television promotion by electric utility com-



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You can depend on your RCA Engineered Sound Distributor for competent assistance in planning your sound installations. He'll back you on custom-designing systems for individual requirements, and can supply the components you need for fast work anywhere. *Now* see what the 12-page, RCA booklet—"Sound in Industry"—can do to help you. Mail that coupon today!

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Diameters from ¼ " to 6". Removable shanks for deep drilling available in most sizes. Sold by hardware retailers, contractors' and mill supply houses everywhere. Super Speed Spiral (solid body) Carbide Masonry Drills also available from ¼ " to 1½ ".

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panies, electric manufacturers, contractors and dealers.

In addition to print and air media support, EEI plans a national "Housepower" contest for home owners. The contest will run from May through September, 1956, and will offer winners hundreds of appliance merchandise prizes and a $10,000 cash grand prize. Based on multiple choice questions dealing with house wiring, plus an entrant-written statement, the contest will be locally sponsored as well as national in character.

Besides advertising and promotional support at the national level, the Institute has planned a program of local tie-in activity to publicize the "Housepower" idea at the local and regional level.

The program is expected to awaken wide interest and stimulate cooperative efforts by all in the electrical industry who are affected by this wiring bottleneck. The utilities themselves, electrical manufacturers of all types, electrical contractors, distributors and dealers are sure, Mr. George feels, to be enthusiastic in their support of the "Housepower" theme. Throughout the life of the campaign, it will be constantly stressed by everyone taking part that "Housepower" is a term and a theme that describes better living through proper wiring and the use of modern electric appliances.



OFFICIAL APPOINTMENT of contractor Leo Dolkart (center) as Chicago Section IES delegate to the Golden Anniversary IES National Technical Conference this fall in Boston, is made at a 50th Anniversary Dinner in Chicago. Section chairman Robert J. Diefenthaler presents Mr. Dolkart with gold pin while IES past president Gilbert K. Hardacre applauds his approval. A 1906 Charter member of the Chicago Section, Mr. Dolkart is an electrical engineer with Commercial Light Company, Chicago electrical contracting firm.

IES Celebrates Golden Anniversary This Year

The Illuminating Engineering Society is celebrating the 50th anniversary of its founding this year, during which time it will be examining and evaluating its contribution toward making the United States the best-lighted nation in the world.

Celebration activities were begun officially when its officers and a group of past presidents held a luncheon on January 11 at New York's Sheraton-Astor Hotel, scene of the Society's birth on January 10, 1906. Sections and Chapters of the Society throughout the United States and Canada simultaneously began the celebration by devoting some or all of their local meetings during January to a review of the Society's history, aims, and objectives. Further activities will be held at the nine Regional Conferences of the Society during April and May, and at the annual National Technical Conference to be held in Boston September 17-21.

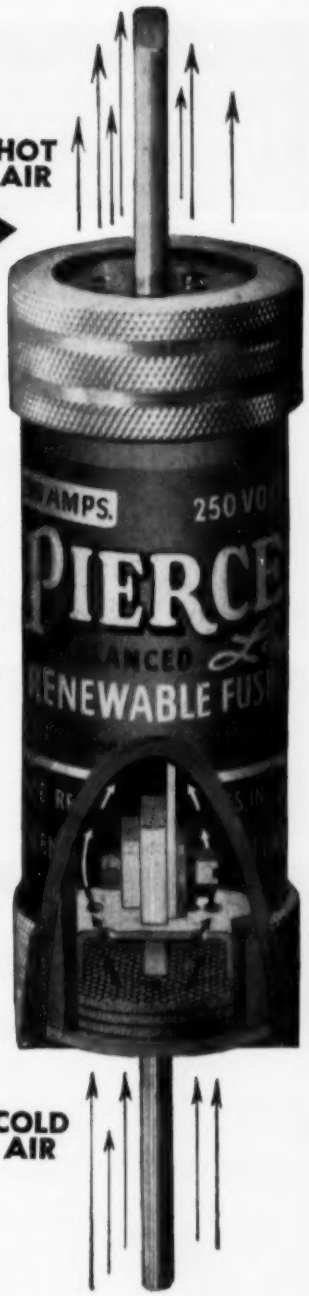
At the kick-off luncheon in New York on January 11, luncheon speakers summed up Society accomplishments as follows: it has helped bring more comfortable light into the home, more productive lighting to factory, mill, office and school, safer lighting to streets, buildings, mines and to all types of public transportation, and more effective and more adaptable lighting to the entertainment field. Moreover, in an area that was still largely a mystery to some of the Society's members 50 years ago, it has gone beyond the borders of conventional illumination to help develop "invisible light" as an agent in industrial safety tests no less than in police detection, to adopt the ultraviolet qualities of light as a tool of the physician, the food- and drug-producer and the fabric manufacturer, and its infra-red qualities as a device for the heating engineer and the physical therapist alike.

Singling out street and highway lighting, a fast-growing problem of government, for mention at the anniversary luncheon, Dr. Samuel G. Hibben, a past-president of the IES and chairman of its Historical Committee, observed that an important task in public education in this field is still far from completion.

"Although more and better street lighting has been proved to be an essential part of the solution to the alarming rise in traffic accidents, an estimated 50,000 miles of Amer-

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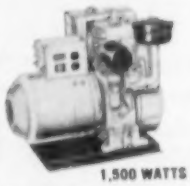
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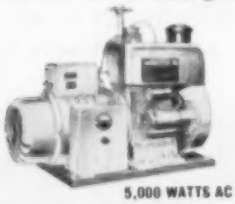
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LIGHTING ENGINEER John J. Neidhart, Westinghouse Electric Corp., Cleveland, explains the salient points of the new IES Office Lighting Practice recommendations to the Chicago Section, IES. As chairman of the IES Committee on Office Lighting, Mr. Neidhart was closely associated with the development of the new standards.

ican highways are still lighted dangerously below the minimum standards recommended by IES after extensive observation and experimentation," he declared.

Among the Society's functions, in addition to supplying lighting codes, standards of measurements, and examples of good lighting practice for safety and efficiency, is an obligation to promote public knowledge of the progress and expectations of engineers in lighting, Dr. Hibben said. Pointing the way to greater safety in highway travel, he emphasized, is one way of fulfilling IES objectives.

Among other speakers, Harry Logan, vice president of the Holophane Company, hailed the lighting engineers for helping their profession "contribute more to the advancement of industry and civilization than any other group," and praised the lighting industry for its great contribution to the financial well-being of the nation.

Seven past-presidents attended the luncheon and, in brief talks, recalled highlights and by-play of the technical conferences at which they presided. Attending were Dr. George S. Crampton of Philadelphia, president 1921-22; Dr. Ward Harrison, chairman of the board, Curtis Lighting Inc., Chicago, president 1922-23; William F. Little, president of the Electrical Testing Laboratories, Inc., of New York, and IES president 1930-31; Joseph W. Barker, former dean of the Columbia University School of Engineering, president 1932-33; Lee

Tayler of Detroit Edison Co., president 1948-49; Dr. Samuel G. Hibben, Westinghouse Lamp Division, president 1953-54; and Duncan M. Jones of Montreal, Canada, president 1954-55. Thirteen past-presidents and more than 20 IES Chapters around the nation sent messages of congratulations.

The New York luncheon was also the occasion for presenting to Ralph H. Freeman, New York regional manager of the Sheraton Hotels, drawings of a bronze plaque to be installed soon in the lobby of the Sheraton-Astor Hotel in commemoration of the organization of the Society there in 1906. Making the presentation on behalf of IES was its current president, Robert F. Hartenstein of the Ohio Edison Company, Akron.

S. W. Hurowitz Elected President of NYECA

At the annual meeting of the New York Electrical Contractors Association, Inc., held on January 12, the following officers were elected for the term ending December 31, 1956: Samuel W. Hurowitz, president; John Doris, vice president; George F. Price, treasurer and Louis Freund, secretary.

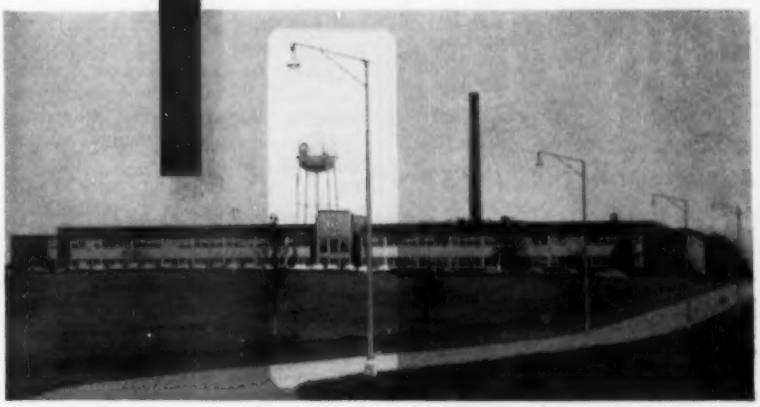
The executive committee consists of Samuel W. Hurowitz, chairman, A. Lincoln Bush, H. F. Fischbach, J. W. Frommer, E. A. Kahn, Frederick Latzer, William Leibfried, S. P. Lipkins, L. C. MacNutt, H. C. Parke, J. M. Watters, Jr., and H. A. Webster.

Cleveland IES Sponsors Lighting Design Course

A course in basic lighting design is being offered this winter by the Cleveland Section of the Illuminating Engineering Society. It will cover such subjects as light sources, lighting terms and concepts, lighting calculations and layout, and lighting application for schools, offices, stores, industrial lighting and others.

This course is intended primarily for newcomers to the lighting industry, according to the sponsors, but it may also be of interest to lighting men desiring a refresher course. It will be presented in six Tuesday evening sessions, beginning Februry 7th. Registration fee is $5.00. Instructors are recruited from the membership of the Cleveland Section of IES.

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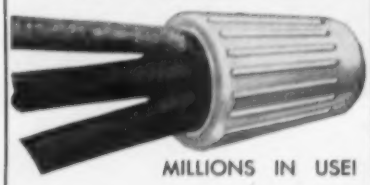
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NEMA to Promote Electric Heating

The first industry-wide promotion of residential electric heating was launched last month at a meeting of the newly named public information committee of the Electric House Heating Equipment Section of the National Electrical Manufacturers Association.

Headed by S. B. Aronson, Queens Village, N. Y., sales manager, Berko Electric Manufacturing Corporation, the committee consists of the following: Robert E. Pequignot, Rochester, N. Y., vice president and general manager, Electromode Division, Commercial Controls Corp.; Robert E. Smith, Providence, R. I., manager of product planning, General Electric Co.; Melvin H. Wessel, Chattanooga, Tenn., sales manager, Cavalier Corp., and LeRoy Staunton, New York, N. Y., sales manager, Uskon heating materials division, U. S. Rubber Co.

The committee's efforts will be directed along three fundamental lines. It will seek to create an awareness on the part of the general public of the advantages of electric house heating, promote greater acceptance of electric house heating among those power suppliers not yet completely "sold" on the idea, and provide fundamental information on the installation and use of electric heating equipment to builders, electrical contractors, electrical distributors and others.

In discussing the objectives of the job ahead, members said that major emphasis will be placed first on eliminating the misconception in the public's mind that electric heating costs are out of line with those for other types of heating equipment. Case studies will be collected to establish this fact and such data will be disseminated through all informational channels.

The growing acceptance of electric heating by hundreds of power suppliers will be employed by the committee to further stimulate its promotion and use across the country. In this connection, the committee will develop practical and useful statistics on load characteristics, operational costs and other factors to help power suppliers understand more clearly the system-wise and revenue benefits to be obtained by them in having additional electric house heating installations on their lines.

Similar facts and promotional materials will be made available to builders, electrical contractors and all industry groups.

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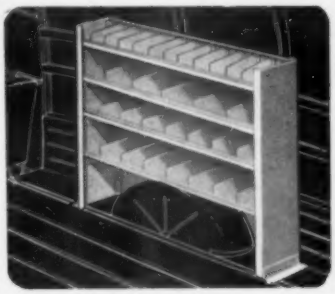
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Certified Lighting Program for Los Angeles

A Certified Lighting Bureau has been organized in Los Angeles, sponsored by the Commercial and Industrial Lighting Division of the Electrical League of Los Angeles. This Bureau will operate a Certified Lighting Program whereby lighting plans will be certified to meet national standards for lighting levels, and installations will be warranted to conform to the lighting plan by the installing contractor.

Another part of the Certified Lighting Program is training courses, covering both lighting fundamentals and lighting sales. The program has interested 86 electrical contractors in Los Angeles, and the training courses have an overflow enrollment. The initial class of 40 has been completely filled, and a probable overflow class of 40 more is being organized.

The Certified Lighting Bureau has been organized within the framework of the National Lighting Bureau, as set up by the National Electrical Manufacturers Association. The Los Angeles Certified Lighting Bureau is the eleventh such group set up to offer and promote Certified Lighting through electrical contractors. Other areas having similar bureaus are: Boston, Mass; Chattanooga, Tenn; Charlotte, N. C; Cincinnati, Ohio; Detroit, Mich; Providence, R. I; Rochester, N. Y; San Diego, Calif; San Francisco, Calif; and Worcester, Mass.

AIEE Study Group On Lighting

A 10-week study group on "New Wiring Methods and Controls for Lighting sponsored by the Illumination Division, New York Section AIEE, began on February 8 with a discussion of Selection of Secondary Distribution for Lighting. Of interest to all individuals concerned with the design, specification or installation of lighting systems, remaining meetings will cover light sources and auxiliaries, commercial and industrial lighting equipment, problems in lighting layout, branch circuit protection, application of the National Electrical Code, cost estimating, and adequate wiring requirements. The group is under the chairmanship of S. H. Hazleton, General Electric Co.

BIG differences in design . . . make BIGGER DIFFERENCES on the job



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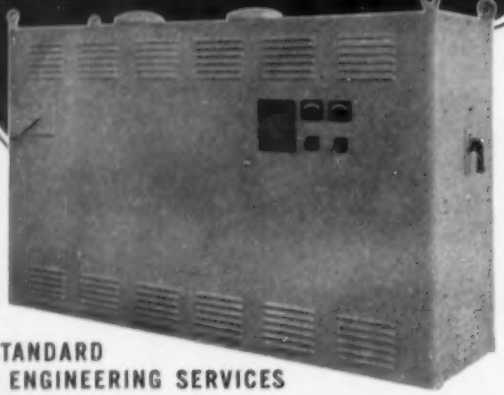
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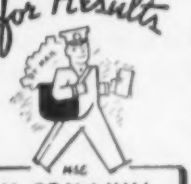
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OMAHA CONTRACTOR R. H. "Bob" Longmore (left), new president of the Nebraska-Iowa Electrical Council, receives congratulations of retiring president George Tice, Cutler-Hammer representative. Mr. Longmore is vice president and general manager of the Omaha Electrical Works, member of the Board of Directors of the Omaha Builders' Exchange and past president of the Midwestern Chapter, NISA. All of his 20 years in the electrical field has been spent with his contracting and motor service firm.

Military Maintenance Acclaimed By AIPE

The American Institute of Plant Engineers, convening in Philadelphia January 24th, paid special tribute to the maintenance divisions of our Armed Forces when they were addressed by O. W. Graveley, Director of Maintenance for the Secretary of Defense; Brig. Gen. Keith R. Barney, USA, Director of Installations, Dept. of the Army; Captain Eugene J. Peltier, Asst. Chief of Maintenance, Bureau of Yards and Docks, Navy Dept., and Col. J. E. Gill of the Air Force.

As featured speaker, Graveley stated that the magnitude of military maintenance can be indicated by the facts that approximately 250,000 civilian and military personnel are engaged in this endeavor, annual expenditures in this field exceed $1½-billion, approximately 10 million repair orders are written each year, and nearly 30 million individual assignments are carried out annually to complete these orders. Stressing the importance of maintenance engineers, Graveley added that they had the responsibility of keeping up with latest designs and developments, solving contractural problems, developing plans and estimates, understanding fundamentals of job control and cost accounting.

DATES AHEAD

Independent Electrical Contractors Assn., Inc.—Annual dinner and dance, Hotel Biltmore, New York, N. Y., February 11.

Rochester Electrical Exposition—Sponsored by the Electrical Association of Rochester, to be held in War Memorial Building, Rochester, N. Y., February 18-25.

National Adequate Wiring Conference—La Salle Hotel, Chicago, Ill., February 23-24.

Upper Midwest Electrical Industry Convention—19th Annual Conference and 8th Biennial Electrical Trade Exposition; St. Paul Hotel and Municipal Auditorium, St. Paul, Minn., Feb. 26-29.

National Electric Sign Association—Annual convention and exhibit, Jefferson Hotel, St. Louis, Mo., February 26-29.

National Electrical Manufacturers Assn.—Edgewater Beach Hotel, Chicago, Ill., March 12-16.

Southeastern Electrical Exchange—Annual meeting, Boca Raton Hotel & Club, Boca Raton, Fla., March 12-14.

Edison Electric Institute—22nd Annual Sales Conference, Edgewater Beach Hotel, Chicago, Ill., March 26-29.

Electrical Industry Show—8th Biennial Show, Shrine Exposition Hall, Los Angeles, Calif., April 5-7.

Illuminating Engineering Society—Regional Conferences: **Southern**—Birmingham, Ala., April 5-7; **Southwestern**—Hilton Hotel, Fort Worth, Texas, April 8-10; **South Pacific Coast**—San Francisco, Cal., April 15-17; **Pacific Northwest**—Davenport Hotel, Spokane, Wash., April 19-21; **Inter-Mountain**—Utah Hotel, Salt Lake City, Utah, April 26-28; **Great Lakes**—Toledo, Ohio, May 7-8; **Midwestern**—Indianapolis, Ind., May 10-11; **Canadian**—Chateau Frontenac, Quebec, P. Q., Canada, May 17-18; and **East Central**—Shoreham Hotel, Washington, D. C., May 24-25.

Western Pa. Safety Engineering Conference and Exhibit—Hotel William Penn, Pittsburgh, Pa., April 10-12.

California International Home Show & Builders Market Week—Oakland Exposition Bldg., Oakland, Calif., April 21-29.

Electrical Manufacturers' Representatives Association of Michigan, Inc.—Ninth Electrical Exhibit, Detroit Artillery Armory, Eight Mile Road, Detroit, Mich., April 24-26.

International Home Building Exposition—New York Coliseum, New York City, May 12-20.

National Industrial Service Association, Inc.—Annual convention Bellevue Stratford Hotel, Philadelphia, Pa., May 13-17.

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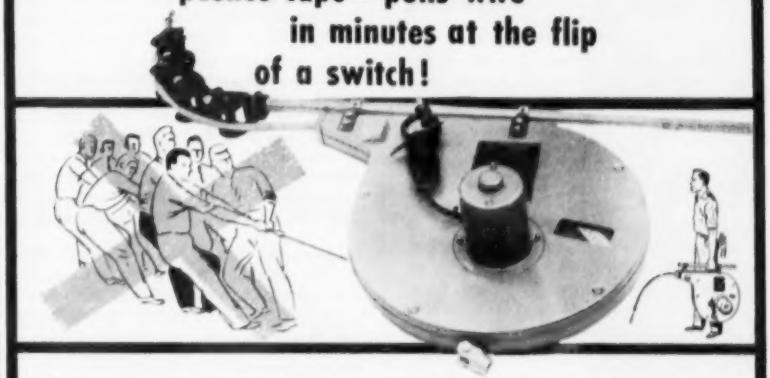
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Pacific Coast Electrical Association, Inc.—Annual convention, Las Vegas, Nev., May 14-16.

Design Engineering Show—Convention Hall, Philadelphia, Pa., May 14-17.

International Association of Electrical Inspectors—State Chapter Meetings: **Florida Chapter**—San Carlos Hotel, Pensacola, Fla., April 6-7; **Kentucky Chapter**—Bowling Green, Ky., May 26-27; **Mississippi Chapter**—Edwards Hotel, Jackson, Miss., Feb. 20-21; **Arizona Chapter**—Tucson, Mar. 10, also Show Low, Ariz., May 12; **North Carolina Chapter**—Carolina Hotel, Raleigh, N. C., April 10-11; **South Carolina Chapter**—Columbia Hotel, Columbia, S. C., April 16-17; **Alabama Chapter**—Whitley Hotel, Montgomery, Ala., April 19-20; **Georgia Chapter**—Ware Hotel, Waycross, Ga., April 23-24; **North Louisiana and Texas Chapters**—Alexandria, La., May 4-5; **Ontario Chapter**—LaSalle Hotel, Kingston, Ontario, Canada, June 2; **Virginia Chapter**—Roanoke Hotel, Roanoke, Va., June 25-26; **Southern California Chapter**—San Diego, Mar. 28, Long Beach, May 23 and Santa Monica, July 25; **Southern Section**—Conrad Hilton Hotel, Dallas, Texas, October 22-24.

Southeastern International Industrial Exposition—Lakewood Park, Atlanta, Ga., May 25.

Edison Electric Institute—24th annual convention, Atlantic City, N. J., June 4-7.

National Fire Protection Association—60th anniversary meeting, Hotel Statler, Boston, Mass., June 4-8.

National Association of Electrical Distributors—48th annual convention, Ambassador-Chelsea Hotels, Atlantic City, N. J., Week of June 10.

New York State Association of Electrical Contractors and Dealers, Inc.—Annual convention, Saranac Inn, Saranac Inn, N. Y., June 24-29.

Illuminating Engineering Society—National Technical Conference, Hotel Statler, Boston, Mass., Sept. 17-21.

Instrument Society of America—Eleventh Annual Instrument Automation Conference and Exhibit, New York Coliseum, New York City, September 17-21.

National Electrical Contractors Assn.—55th Anniversary convention and Second National Electrical Exposition, Sheraton-Palace Hotel, San Francisco, Calif., September 23-29.

National Electronics Conference—Hotel Sherman, Chicago, Ill., October 1-3.

International Association of Electrical Leagues—21st annual conference, Sheraton-Cadillac Hotel, Detroit, Mich., October 3-6.

National Electrical Manufacturers Association—Annual meeting, Traymore Hotel, Atlantic City, N. J., November 12-16.

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Among the Manufacturers

Headquarters Announcements

Square D Company, Detroit, Mich.—F. W. Magin, chairman of the board of directors; A. G. Patterson, president of Electric Controller & Mfg. Co. prior to its merger with Square D, has been elected president of Square D. Dr. John D. Leitch, vice president—engineering for Square D; Alvin C. Dyer, vice president and general manager of Electric Controller Div.

H. K. Porter Co., Inc., Eseco Div., Joliet, Ill.—R. W. Dixon, vice president and general manager.

Vitro Corp. of America, New York, N. Y.—Albert G. Noble, executive vice president.

General Electric Co., Distribution Assemblies Dept., Plainville, Conn.—Allan A. Watson, manager—assemblies and components sales.

Thor Power Tool Co., Aurora, Ill.—Dean C. Smith, vice president, manufacturing; John A. McGuire, vice president.

Columbia Cable & Electric Corp., Brooklyn, N. Y.—D. I. Feldman, sales engineer.

Lambda Electronics Corp. has opened a new plant at 11-11 131 St., College Point, N. Y.

Orangeburg Mfg. Co., Inc., Orangeburg, N. Y.—Thomas R. Cataldo, underfloor duct sales manager.

Graybar Electric Co., New York, N. Y.—S. W. Scott and E. R. Yonkers, members of the board of directors.

Electric Storage Battery Co., Philadelphia, Pa.—D. Nevin Smith, vice president.

General Electric Co., Construction Materials Div., Providence, R. I.—R. D. Graham, sales manager—construction products and W. R. Becker, sales manager—consumer products for the Wiring Device Dept.

Rome Cable Corp., Rome, N. Y.—Alfred S. Foote, director.

Line Material Co., Milwaukee, Wis.—Rodgers G. Wheaton, president; Earle W. Williams, vice president in charge of sales and marketing; W. M. Dusenberry, sales manager.

Plymouth Rubber Co., Inc., Canton, Mass.—James Fenn, sales manager of the Electrical Tape Div.

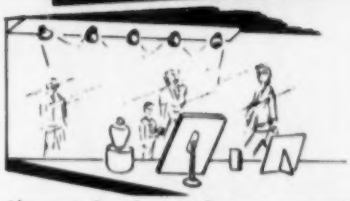
Westinghouse Electric Corp., Pittsburgh, Pa.—John W. Craig,

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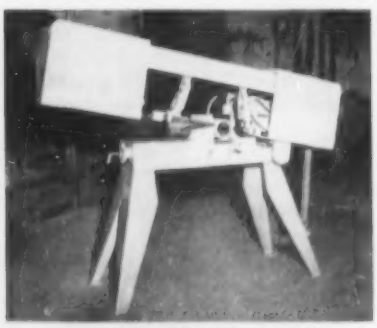
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vice president and general manager of Electric Appliance Divisions.

General Electric Co., Weathertron Dept., Bloomfield, N. J.—G. K. Marshall, manager — product planning.

T. J. Cope, Inc. and its Instrof Corp. division have relocated their manufacturing operations to Collegeville, Pa. Sales and executive offices will be moved there in April.

Cornell-Dubilier Electric Corp., South Plainfield, N. J.—William C. Otto, industrial sales manager, Indianapolis Division.

Carboloy Dept., General Electric Co., Detroit, Mich.—J. D. Kennedy, manager-component sales.

Jefferson Electric Co., Bellwood, Ill.—James R. Bailey, sales manager of the Ballast Div.

Union Carbide & Carbon Corp., New York, N. Y.—William B. Humes and T. J. Coleman, president and general manager, respectively, of the new Silicones Division.

General Electric Co., Silicone Products Dept., Waterford, N. Y. —J. T. Castles, manager of Elastomer Market Development.

Reynolds Metals Co., New York, N. Y.—J. Louis Reynolds, executive vice president.

Electriglas Sales Corp., Newark, N. J., has been organized to handle sales for Electriglas Corp., heating equipment manufacturer.

Duro-Test Corp., North Bergen, N. J.—Smith A. Goff, vice president.

Burndy Engineering Co., Inc., Norwalk, Conn.—Julian Rogoff, vice president.

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—William G. Scholl, executive vice president.

Precision Transformer Corp., has relocated to 2218 W. Lake St., Chicago, Ill.

Watson Flagg Machine Co., Patterson, N. J., has been purchased by General Electric Co. The plant will be headquarters of the new Gear Motor and Transmission Components Dept. Lewis J. Burger will be dept. general manager.

Regional Appointments

NEW ENGLAND

Crouse-Hinds Co.: Donald J. Parker, manager of the Boston region, which has been incorporated into the New York sales division under Arthur F. Uhrlandt.

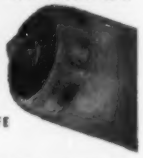
MIDDLE ATLANTIC

Okonite Co.: Walter E. Garrigan, manager of new sales office and warehouse in Syracuse, N. Y.

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General Controls Co.: Byron B. Spinney, regional representative for New York office; headquarters in Long Island City.

Clark Controller Co.: R. E. Peterson, district application engineer at the Pittsburgh, Pa. office.

SOUTH ATLANTIC

American Brass Co.: L. C. Pratt, sales representative for American Metal Hose Div.; headquarters at Atlanta district sales office.

Sylvania Electric Products Inc.: Noel C. Bride, district lighting sales manager for Washington, D. C. Offices in Alexandria, Va.

EAST CENTRAL

Pittsburgh Standard Conduit Co.: Goehler and Adams, sales agents for Wisconsin and Upper Michigan. Offices in Milwaukee and Appleton, Wis.

John A. Roebling's Sons Corp.: Thomas A. Martino, electrical wire and cable salesman for southeastern Michigan; from Detroit office.

Graybar Electric Co.: John Reine, district manager at Chicago, Ill. Lester Samples, manager of new office and warehouse at 745 E. Third St., Lexington, Ky.

General Controls Co.: George A. Williams, Jr., manager of the Detroit, Mich., factory branch office. John F. Dickson, manager at Chattanooga, Tenn.

Burndy Engineering Co., Inc.: Charles W. Ashby, representative for sections of Alabama, Tennessee and Florida; headquarters in Birmingham.

Wagner Electric Corp.: Herbert B. Nechemias, mgr. electrical division branch office at Cincinnati, O.

WEST CENTRAL

Rome Cable Corp.: G. A. Peabody, manager of new distribution and sales office in Houston, Texas.

American Brass Co.: John J. Moran, sales representative for American Metal Hose Div. in the St. Louis, Mo. district sales office.

General Controls Co.: R. C. Servat, mgr. Houston, Tex. branch.

WEST

Lightolier, Inc.: West Coast sales office has been opened in Los Angeles at 802 Brack Shops Bldg.

Harvey Hubbell, Inc.: San Francisco district sales office has been moved to 1675 Hudson Ave.

Line Material Co.: New office and warehouse at 980 South Sixth West St., Salt Lake City, Utah.

Wagner Electric Corp.: John K. Oliver, manager of electrical division branch office in Portland, Ore.

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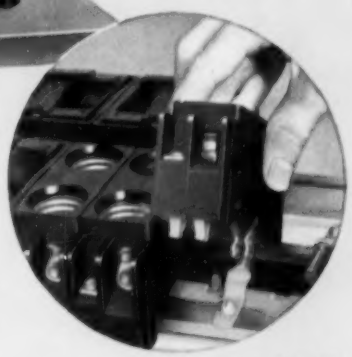
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Boxes, interiors and fronts, as well as packaged plug-in units (plug fuse or pullout types) are available off-the-shelf from your Square D distributor—right now!



All plug-in units feature Square D's exclusive *SWINGRIP* mounting—easy, speedy installation, automatic alignment and positive contact with bus bars.

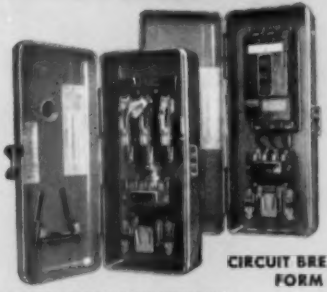
***Write* for Bulletin SD-36. Square D Company, 6060 Rivard Street, Detroit 11, Michigan.**

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

WHY G-E COMBINATION STARTERS ARE...

Better for you

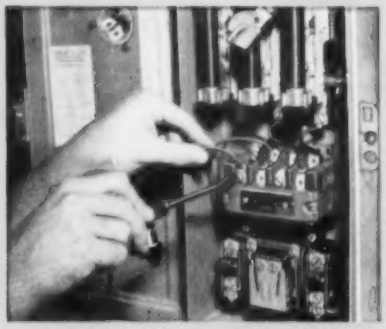


CIRCUIT BREAKER FORM

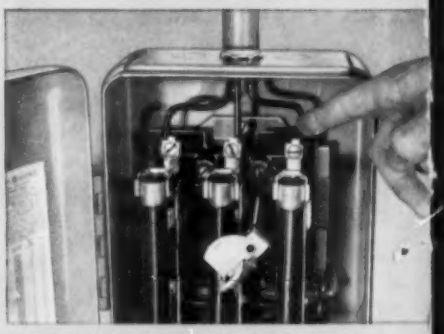
NON-FUSIBLE AND FUSIBLE DISCONNECT SWITCH FORMS



QUICKER MOUNTING—combination starters save you money because the starter and safety switch are in one enclosure. Single unit is supported by a keyhole slot while mounting screws are inserted and tightened.

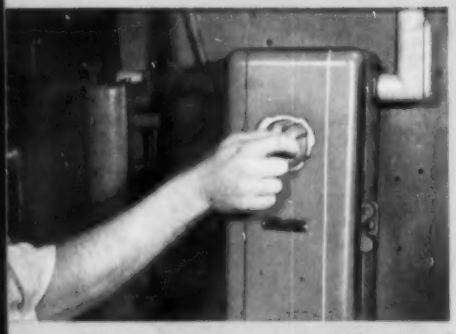


REDUCED WIRING TIME—starter and disconnect switch are prewired at the factory to cut your costs. The time you would spend making interconnections between the starter and disconnect switch is saved.



EASIER CONNECTIONS—plenty of space for wiring speeds installation. All wiring to switch and starter is front connected and twelve combination knockouts in the top, bottom, sides and back simplify wiring.

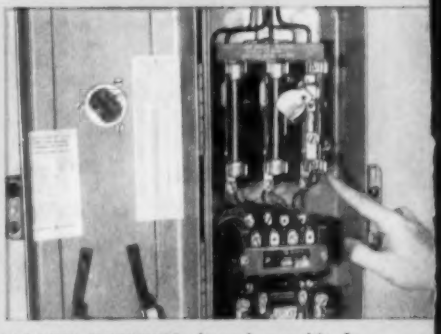
Better for your customer



GREATER SAFETY—mechanically interlocked door protects personnel. Door can't open when power is "ON", and the switch position is clearly indicated. Operating handle and enclosure door can both be padlocked.



SMALLER MOUNTING AREA—combination starter saves more machine space than a separate starter and safety switch. Also, better appearance results from the modern design of combination starter enclosure.



GREATER FLEXIBILITY—interchangeable fuse clips for the disconnect switch reduce your stocking costs. Clips can be added to non-fusible forms, or changed in size on fusible forms. Fuse clips are available in kit form.

Every time you plan to install a separate starter and safety switch, you will save time and money—and benefit your customer—if you use a General Electric combination starter. Combination starters are available with a non-fusible or fusible disconnect switch, or a circuit breaker. They include all the proved features of G-E magnetic starters such as strongbox coil, permanent air gap, bi-metallic overload relays, and all the speedy installation features that reduce your costs.

The next time you need a starter with a disconnecting means, or short-circuit protection, choose a combination starter from General Electric's complete line of quality control. *General Purpose Control Department, Bloomington, Illinois.* 733-3

For further information, contact your G-E Apparatus Distributor.

GENERAL ELECTRIC